I. STATUS OF CLAIMS

Claims 1-45 are pending.

Claims 21-40 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. *Office action,* p. 4 (02 August 2007).

Claims 21-40 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. *Office action*, p. 4 (02 August 2007).

Claims 12-13, 32-33, and 41-44 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. *Office action*, p. 5 (02 August 2007).

Claims 1, 7-11, 21, and 27-31 stand rejected under 35 U.S.C. § 102(a) as being anticipated by "The design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden *et al.* *Office action*, p. 7 (02 August 2007).

Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Mulgund *et al.* (2002/0161751). *Office action*, p. 9 (02 August 2007).

Claims 2 and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over "The Design of an Acquisitional Query Processor For Sensor networks" by Samuel Madden et al. in view of Chiloyan *et al.* (U.S. Patent No. 7,165,109). *Office action*, p. 11 (02 August 2007).

Claims 3-6 and 23-26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden *et al.* in view of Godlewski (U.S. Patent No. 6,421,354). *Office action*, p. 12 (02 August 2007).

Claims 13, 33, and 41-44 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mulgund *et al.* (2002/-161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden *et al.* *Office action*, p. 13 (02 August 2007).

Claims 16, 17, 36, and 37 stand rejected under 35 U.S.C. § 103(a) as being upatentable over Mulgund *et al.* (2002/0161751) in view of Kung *et al.* (2005/0021724). *Office action*, p. 15 (02 August 2007).

II. ISSUES TO BE REVIEWED

The issues in this response relate to whether the art of record establishes a *prima facie* case of the unpatentability of Applicant's Claims 1-45. For reasons set forth elsewhere herein, Applicant respectfully asserts that the art of record does not establish a prima facie case of the unpatentability of any pending claim. Accordingly, Applicant respectfully requests that Examiner hold all pending Claims 1-45 allowable for at least the reasons described herein, and issue a Notice of Allowance on same.

III. ARGUMENT: ART OF RECORD DOES NOT ESTABLISH *PRIMA FACIE* CASE OF UNPATENTABILITY IN VIEW OF CITED ART OF RECORD

The Office action states: Claims 21-40 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. *Office action,* p. 4 (02 August 2007).

Further, the Office action states: Claims 21-40 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. *Office action*, p. 4 (02 August 2007).

Further, the Office action states: Claims 12-13, 32-33, and 41-44 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. *Office action*, p. 5 (02 August 2007).

Further, the Office action states: Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden *et al.* *Office action*, p. 7 (02 August 2007).

Further, the Office action states: Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund *et al.* (2002/0161751). *Office action*, p. 9 (02 August 2007).

Further, the Office action states: Claims 2 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over "The Design of an Acquisitional Query Processor For Sensor networks" by Samuel Madden et al. in view of Chiloyan *et al.* (U.S. Patent No. 7,165,109). *Office action*, p. 11 (02 August 2007).

Further, the Office action states: Claims 3-6 and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden *et al.* in view of Godlewski (U.S. Patent No. 6,421,354). *Office action*, p. 12 (02 August 2007).

Further, the Office action states: Claims 13, 33, and 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund *et al.* (2002/-161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden *et al. Office action*, p. 13 (02 August 2007).

Still further, the Office action states: Claims 16, 17, 36, and 37 are rejected under 35 U.S.C. 103(a) as being upatentable over Mulgund *et al.* (2002/0161751) in view of Kung *et al.* (2005/0021724). p. 15 (02 August 2007).

A. MPEP Standards for Patentability[1]

The MPEP states as follows: "the examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a prima facie case of unpatentability. If that burden is met, the burden of coming forward with evidence or argument shifts to the applicant... If examination at the initial stage does not produce a prima facie case of unpatentability, then without more the applicant is entitled to grant of the patent." MPEP § 2107 (citing *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992)); *In re Glaug* 283 F.3d 1335, 62 USPQ2d 1151 (Fed. Cir. 2002). ("During patent examination the PTO bears the initial burden of presenting a *prima facie* case of unpatentability. *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed. Cir. 1984). If the PTO fails to meet this burden, then the applicant is entitled to the patent.").

[1] Applicant is aware that Examiner is familiar with the MPEP standards. Applicant is merely setting forth the MPEP standards to serve as a framework for Applicant's arguments following and to ensure a complete written record is established. Should Examiner disagree with Applicant's characterization of the MPEP standards, Applicant respectfully requests correction.

Accordingly, unless and until an examiner presents evidence establishing *prima facie* unpatentability, an applicant is entitled to a patent on all claims presented for examination.

1. MPEP Standards for Determining Anticipation

An examiner bears the initial burden of factually supporting any *prima facie* conclusion of anticipation. *In re Skinner*, 2 U.S.P.Q.2d 1788, 1788-89 (B.P.A.I. 1986); MPEP § 2107 (citing *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992) ("[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a prima facie case of unpatentability....")). Failure of an examiner to meet this burden entitles an applicant to a patent. *Id.* ("[i]f examination at the initial stage does not produce a prima facie case of unpatentability, then without more the applicant is entitled to grant of the patent").

The MPEP indicates that in order for an examiner to establish a *prima facie* case of anticipation of an applicant's claim, the examiner must first interpret the claim[2], and thereafter show that the cited prior art discloses the same elements, in the same arrangement, as the elements of the claim which the examiner asserts is anticipated. More specifically, the MPEP states that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. . . . The identical invention must be shown in as complete detail as is contained in the . . . claim. . . . The elements must be arranged as required by the claim . . . ."). MPEP § 2131. Consequently, under the guidelines of the MPEP set forth above, if there is any substantial difference between the prior art cited by an examiner and an applicant's claim which the examiner asserts is rendered anticipated by the prior art, the prior art does NOT establish a *prima facie* case of anticipation and, barring other rejections, the applicant is entitled to a patent on such claim.

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[2] With respect to interpreting a claim at issue, the MPEP directs that, during examination -- as opposed to subsequent to issue -- such claim be interpreted as broadly as the claim terms would reasonably allow, in light of the specification, when read by one skilled in the art with which the claimed invention is most closely connected. *MPEP* § 2111.

2. MPEP Standards for Determining Obviousness

"[T]he examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness."[3] *MPEP* § 2142. The MPEP indicates that in order for an examiner to establish a *prima facie* case that an invention, as defined by a claim at issue, is obvious, the examiner must (1) interpret the claim at issue; (2) define one or more prior art reference components relevant to the claim at issue; (3) ascertain the differences between the one or more prior art reference components and the elements of the claim at issue; and (4) adduce objective evidence which establishes, under a preponderance of the evidence standard, a teaching to modify the teachings of the prior art reference components such that the prior art reference components can be used to construct a device substantially equivalent to the claim at issue. This last step generally encompasses two sub-steps: (1) adducement of objective evidence teaching how to modify the prior art components to achieve the individual elements of the claim at issue; and (2) adducement of objective evidence teaching how to combine the modified individual components such that the claim at issue, as a whole, is achieved. *MPEP* § 2141; *MPEP* § 2143. Each of these forgoing elements is further defined within the MPEP. *Id.*

Interpreting a Claim at Issue

With respect to interpreting a claim at issue, the MPEP directs that, during examination -- as opposed to subsequent to issue -- such claim be interpreted as broadly as the claim terms would reasonably allow when read by one skilled in the art with which the claimed invention is most closely connected. In practice, this is achieved by giving each of the terms in the claim the "plain meaning" of the terms as such would be understood by those having ordinary skill in the art, and if portions of the claim have no

[3] An invention, as embodied in the claims, is rendered obvious if an examiner concludes that although the claimed invention is not identically disclosed or described in a reference, the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *MPEP* § 2141 (citing 35 U.S.C. § 103).

"plain meaning" within the art, or are ambiguous as used in a claim, then the examiner is to consult the specification for clarification. *MPEP* § 2111.

Definition of One or More Prior Art Reference Components Relevant to the Claim at Issue

Once the claim at issue has been properly interpreted, the next step is the definition of one or more prior art reference components (*e.g.*, electrical, mechanical, or other components set forth in a prior art reference) relevant to the properly interpreted claim at issue. With respect to the definition of one or more prior art reference components relevant to the claim at issue, the MPEP defines three proper sources of such prior art reference components, with the further requirement that each such source must have been extant at the time of invention to be considered relevant. These three sources are as follows: patents as defined by 35 U.S.C. § 102, printed publications as defined by 35 U.S.C. § 102, and information (*e.g.*, scientific principles) deemed to be "well known in the art"[4] as defined under 35 U.S.C. § 102. *MPEP* § 2141.

Ascertainment of Differences between Prior Art Reference Components and Claim at Issue; Teaching to Modify and/or Combine Prior Art Reference Components to Remedy Those Differences in Order to Achieve Recitations of Claim at Issue

With one or more prior art components so defined and drawn from the proper prior art sources, the differences between the one or more prior art reference components and the

[4] The fact that information deemed to be "well known in the art" can serve as a proper source of prior art reference components seems to open the door to subjectivity, but such is not the case. As a remedy to this potential problem, *MPEP* § 2144.03 states that if an examiner asserts that his position is derived from and/or is supported by a teaching or suggestion that is alleged to have been "well known in the art," and that if an applicant traverses such an assertion (that something was "well known within the art"), the examiner must cite a reference in support of his or her position. The same MPEP section also states that when a rejection is based on facts within the personal knowledge of an examiner, the data should be stated as specifically as possible, and the facts must be supported, when called for by the applicant, by an affidavit from the examiner. Such an affidavit is subject to contradiction or explanation by the affidavits of the applicant and other persons. *Id.* Thus, all sources of prior art reference components must be objectively verifiable.

elements of the claim at issue are to be ascertained. Thereafter, in order to establish a case of *prima facie* obviousness, an examiner must set forth a rationale, supported by objective evidence[5] sufficient to demonstrate under a preponderance of the evidence standard, that in the prior art extant at the time of invention there was a teaching to modify and/or combine the one or more prior art reference components to construct a device practicably equivalent to the claim at issue.

The preferable evidence relied upon is an express teaching to modify/combine within the properly defined objectively verifiable sources of prior art. In the absence of such express teaching, an examiner may attempt to establish a rationale to support a finding of such teaching reasoned from, or based upon, express teachings taken from the defined proper sources of such evidence (*i.e.*, properly defined objectively verifiable sources of prior art). *MPEP* § 2144; *In re Dembiczak*, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999).

The MPEP recognizes the pitfalls associated with the tendency to subconsciously use impermissible "hindsight" when an examiner attempts to establish such a rationale. The MPEP has set forth at least two rules to ensure against the likelihood of such impermissible use of hindsight. The first rule is that:

> under 35 U.S.C. 103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information,[6] the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of an Applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search, and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon an Applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

[5] The proper sources of the objective evidence supporting the rationale are the defined proper sources of prior art reference components, discussed above, with the addition of factually similar legal precedent. *MPEP* § 2144.

[6] "Factual information" is information actually existing or occurring, as distinguished from mere supposition or opinion. *Black's Law Dictionary* 532 (5th ed. 1979).

MPEP § 2142 (emphasis added). Thus, if the only objective evidence of such teaching to modify and/or combine prior art reference components is an applicant's disclosure, no evidence of such teaching exists.[7]

The second rule is that if an examiner attempts to rely on some advantage or expected beneficial result that would have been produced by a modification and/or combination of the prior art reference components as evidence to support a rationale to establish such teachings to modify and/or combine prior art reference components, the MPEP requires that such advantage or expected beneficial result be objectively verifiable teachings present in the acceptable sources of prior art (or drawn from a convincing line of reasoning based on objectively verifiable established scientific principles or teachings). *MPEP* § 2144. Thus, as a guide to avoid the use of impermissible hindsight, these rules from the MPEP make clear that absent some objective evidence, sufficient to persuade under a preponderance of the evidence standard, no teaching of such modification and/or combination exists.[8]

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[7] An applicant may argue that an examiner's conclusion of obviousness is based on improper hindsight reasoning. However, "[a]ny judgment on obviousness is in a sense necessarily a reconstruction based on hindsight reasoning, but <u>so long as it</u> takes into account only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and <u>does not include knowledge gleaned only from applicant's disclosure</u>, such a reconstruction is proper." *MPEP* § 2145(X)(A) (emphasis added).

[8] *In Re Sang Su Lee* 277 F.3d 1338 (Fed. Cir. 2002) ("When patentability turns on the question of obviousness, the search for and analysis of the prior art includes evidence relevant to the finding of whether there is a teaching, motivation, or suggestion to select and combine the references relied on as evidence of obviousness.") *See, e.g., McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351-52, 60 U.S.P.Q.2d 1001, 1008 (Fed. Cir. 2001) ("the central question is whether there is reason to combine [the] references," a question of fact drawing on the *Graham* factors). <u>*"The factual inquiry whether to combine references must be thorough and searching." Id. It must be based on objective evidence of record. This precedent has been reinforced in myriad decisions, and cannot be dispensed with.*</u> *See, e.g., Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1124-25, 56 U.S.P.Q.2d 1456, 1459 (Fed. Cir. 2000) ("a showing of a suggestion, teaching, or motivation to combine the prior art references is an 'essential component of an obviousness holding'") (quoting *C.R. Bard, Inc., v. M3 Systems, Inc.*, 157 F.3d 1340, 1352, 48 U.S.P.Q.2d 1225, 1232 (Fed. Cir. 1998)); *In re Dembiczak*, 175 F.3d 994, 999, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999) ("Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references."); *In re Dance*, 160 F.3d 1339, 1343, 48 U.S.P.Q.2d 1635, 1637 (Fed. Cir. 1998) (there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant); *In re Fine*, 837 F.2d 1071, 1075, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988) ("'teachings of references can be combined <u>only</u> if there is some suggestion or incentive to do so.'") (emphasis in original) (quoting *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984)). The need for specificity pervades this authority. *See, e.g., In re Kotzab*, 217 F.3d 1365, 1371, 55

B. Technical Material Cited in Office Action Does Not Show/Suggest Recitations of Independent Claims 1-45; Notice of Allowance of Same Respectfully Requested

1. Independent Claim 1

Claim 1 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 1.

Claim 1 recites:

> 1. A method comprising:
> determining at least one of a sensing function or a control function at a mote; and
> creating one or more mote-addressed content indexes in response to said determining.

The Office action at page 7, paragraph 11, recites:

> 11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action at page 7, paragraph 11, recites:

> As to claims 1 and 21, Madden et al. shows determining at least one of a sensing function or a control function at a mote [sampling a sensor s to evaluate any predicate over the attribute sensors (section 4.2 Ordering of Sampling And Predicates)]; and creating one or more mote-addressed content indexes in response to said determining [creating and maintaining a catalog of metadata that describes a particular mote's local attributes, events, and information about the costs of processing and delivering data (section 4.1 Metadata Management, and Table 2, and 3)].

U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000) ("particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed"); *In re Rouffet*, 149 F.3d 1350, 1359, 47 U.S.P.Q.2d 1453, 1457-58 (Fed. Cir. 1998) ("even when the level of skill in the art is high, the Board must identify specifically the principle, known to one of ordinary skill, that suggests the claimed combination. In other words, the Board must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious.")).

Madden also shows that recited functions are performed by a TinyDB (section 1 Introduction, paragraph 4).

Claim 1 recites, " determining at least one of a sensing function or a control function at a mote." In contrast, "sampling a sensor s to evaluate any predicate over the attribute sensor" at section 4.2 of Madden et al., which is recited in the Office action in support of the rejection fails to recite, "determining at least one of a sensing function or a control function at a mote," as recited in claim. 1. Further, based on an analysis of the Office action, the above quoted recitation from Madden et al., and claim 1, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. with the recitation of claim 1, "determining at least one of a sensing function or a control function at a mote." Hence, the Office action fails to show how Madden et al. teaches or suggests "determining at least one of a sensing function or a control function at a mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 1. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 1.

Claim 1 recites, "creating one or more mote-addressed content indexes in response to said determining." The Office action cites to paragraph 4.1 of Madden in support of the rejection of claim 1. However, in contrast to claim 1, Madden et al., at paragraph 4.1, recites, "Each node in Tiny DB maintains a catalog of metadata that describes its local attributes, events, and user-defined functions." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 1, "creating one or more mote-addressed content indexes in response to said determining." Further, for the material cited, the Office action has supplied not text, reference, or knowledge explaining why one skilled in the are should equate "catalog" with "index" or "maintains" with "creating." Hence, the Office action fails to show how Madden et al. teaches or suggests "creating one or more mote-addressed content indexes in response to said determining." Thus, the Office action fails to state a *prima facie* case of anticipation with

respect to claim 1. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 1.

Claim 1 was rejected under 35 U.S.C. § 102(a) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 1.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

More specifically, the Office action at page 9, paragraph 12, recites:

As to claims 1 and 21, Mulgund shows

determining at least one of a sensing function or a control function at a mote [discovering and maintaining the distributed sensor network topology (paragraph [0007]) wherein at least one of a sensing function or a control function is interpreted to be at least one of the data elements outlined in paragraphs 0021 – 0024]; and

creating one or more mote-addressed content indexes in response to said determining [building a database model by updating relational database logical design tables at each step of the discovering step (paragraph 0007)].

Mulgund also shows a sensor network modeling agent (summary of the invention) for performing the recited functions.

Mulgund at paragraphs 0007, 0021-0024, and "summary" recites:

[0007] In another aspect, the present invention is a method of database modeling that makes it possible to create, store, and update a virtual model of a network of sensors within a relational database structure. The network modeling agent dynamically updates various sensor node data and link data that collectively define an instantaneous "state" of the sensor network into the database logical design. The network modeling agent thereby facilitates access, visualization, and the use of a stream of information generated by the network of distributed sensors. The sensor nodes to be interrogated by the network modeling agent are assumed to be uniquely addressable and in communication, using networking protocols, with one another through links and with a database server through one or more access points. A method according to the present invention comprises the

steps of discovering and maintaining the distributed sensor network topology by applying at every access point a quasi-recursive algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and push it onto the stack. The network modeling agent builds the database model by updating relational database logical design tables at each step of the discovering step. The agent maintains the database model by periodically reapplying the interrogating algorithm, thereby updating the database model to account for sensor node and link additions and deletions. The periodicity of updates is preferably such that a near real-time topology of the sensor network is maintained.

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;
[0022] a connectivity of each of the sensing nodes 2; i.e., a structural representation of the network topology that could be used to reconstruct a diagram such as FIG. 1;
[0023] an up-to-date information content at each of the sensing nodes 2; i.e., a real-time snapshot and time-history of the data of interest generated at each node location by an attached suite of sensors 16, as depicted in FIG. 2; and
[0024] a history of the network 4 from the moment the model was first constructed, which would allow a reconstruction of the network's state at any time in the past.

[0006] In one aspect, the present invention is an information architecture that permits the Internet to contact distributed sensors at one point, databases and mining engines at another point, and users at another point. In this aspect, the invention is an enabling interface between the Internet and the physical world. Due to the global reach of the Internet, these physical points of contact may be distributed anywhere in the world. The Applicants have invented a sensor network modeling agent for use with a relational database and a logical design resident therein.
[0007] In another aspect, the present invention is a method of database modeling that makes it possible to create, store, and update a virtual model of a network of sensors within a relational database structure. The network modeling agent dynamically updates various sensor node data and link data that collectively define an instantaneous "state" of the sensor network

> into the database logical design. The network modeling agent thereby facilitates access, visualization, and the use of a stream of information generated by the network of distributed sensors. The sensor nodes to be interrogated by the network modeling agent are assumed to be uniquely addressable and in communication, using networking protocols, with one another through links and with a database server through one or more access points. A method according to the present invention comprises the steps of discovering and maintaining the distributed sensor network topology by applying at every access point a uqasi-recursive [sic] algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and push it onto the stack. The network modeling agent builds the database model by updating relational database logical design tables at each step of the discovering step. The agent maintains the database model by periodically reapplying the interrogating algorithm, thereby updating the database model to account for sensor node and link additions and deletions. The periodicity of updates is preferably such that a near real-time topology of the sensor network is maintained.
> [0008] In another embodiment, the present invention is a method as described above, wherein the logical design tables further comprise a data table for mapping between one or more sensor nodes and the tables used to store the associated sensor output data associated with the one or more sensor nodes.
> [0009] In certain embodiments, the present invention is used in modeling networks comprised of mobile sensor nodes. The sensor nodes may communicate by wired or wireless means. The database server used with the present invention may be remotely located from the distributed sensor network.

Claim 1 recites, "determining at least one of a sensing function or a control function at a mote." In contrast, Mulgund et al., at paragraph 0007 recites:

> A method according to the present invention comprises the steps of discovering and maintaining the distributed sensor network topology by applying at every access point a quasi-recursive algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack

> is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and push it onto the stack.

Based on an analysis of the Office action, the above quoted citation from Mulgund et al., and claim 1, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. with the recitation of claim 1, "determining at least one of a sensing function or a control function at a mote." Further, for the quoted material, the Office action has supplied not text, reference, or knowledge explaining why one skilled in the art should equate "discovering and maintaining the distributed sensor network topology" as recited in Mulgund et al. with "determining at least one of a sensing function or a control function at a mote" as recited in claim 1. Further, Mulgund et al. recites "discovering" a "network topology," while claim 1 recites, "determining at least one of a sensing function or a control function at a mote." And the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate "discovering" and "network topology" with "determining at least one of a sensing function or a control function at a mote" as recited in claim 1. Hence, the Office action fails to show how Mulgund et al. teaches or suggests "determining at least one of a sensing function or a control function at a mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 1. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 1.

Claim 1 recites, "creating one or more mote-addressed content indexes in response to said determining." In contrast to claim 1, Mulgund et al., at paragraph 007 recites, "The network modeling agent builds the database model by updating relational database logical design tables at each step of the discovering step." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from

Madden et al. or any other material included in Madden et al. with the recitation of claim 1, "creating one or more mote-addressed content indexes in response to said determining." Further, for the material cited, the Office action has supplied not text, reference, or knowledge explaining why one skilled in the are should equate "database model" with "mote-addressed content indexes." Hence, the Office action fails to show how Madden et al. teaches or suggests "creating one or more mote-addressed content indexes in response to said determining." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 1. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 1.

2. Dependent Claims 7-11

Claims 7-11 were rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden *et al.* Applicant respectfully traverses the rejection of claims 7-11.

Claims 7-11 are dependent on claim 1. For reasons analogous to those stated above with respect to claim 1, Applicant respectfully submits that the Office action fails to state a *prima facie* case of anticipation with respect to claim 1. Therefore, Applicant requests withdrawal of the rejections and reconsideration and allowance of claims 7-11.

3. Dependent Claim 7 -- Independently Patentable

Claim 7 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 7.

Claim 1 recites:

> A method comprising:
> determining at least one of a sensing function or a control function at a mote; and
> creating one or more mote-addressed content indexes in response to said determining.

Claim 7 recites:

> The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
> creating at least one extensible index.

The Office action at page 7, paragraph 11, recites:

> Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action, at page 7, paragraph 12, recites:

> As to claims 7 and 27, Madden shows creating at least one extensible index [a sensors table, which is conceptually unbounded (section 3.1 paragraph 3)].

Madden at section 3.1, paragraph 3 recites:

Note that the sensors table is (conceptually) an unbounded, continuous data stream of values; as is the case in other streaming and online systems, certain blocking operations (such as sort and symmetric join) are not allowed over such streams unless a bounded subset of the stream, or window, is specified. Windows in TinyDB are defined as fixed-size materialization points over the sensor streams. Such materialization points accumulate a small buffer of data that may be used in other queries. Consider, as an example:

CREATE
STORAGE POINT recentlight SIZE 8
AS (SELECT nodeid, light FROM sensors SAMPLE INTERVAL 10s)

Claim 7 recites, "creating at least one extensible index." In contrast to claim 7, Madden et al., at section 3.1, paragraph 3 recites, "Note that the sensors table is (conceptually) an unbounded, continuous data stream of values . . . ." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim

7, "creating at least one extensible index." Further, for the material cited, the Office action has supplied not text, reference, or knowledge explaining why one skilled in the are should equate "sensors table" with "extensible index" for "one or more mote-addressed content indexes," as recited in claim 7. Hence, the Office action fails to show how Madden et al. teaches or suggests "creating at least one extensible index." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 7. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 7.

4. Dependent Claim 8 -- Independently Patentable

Claim 8 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 8.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 7 is dependent on claim 1. Claim 7 recites:

7. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
creating at least one extensible index.

Claim 8 is dependent on claim 7. Claim 8 recites:

The method of Claim 7, wherein said creating at least one extensible index further comprises:
creating the at least one extensible index in response to a type of content indexed.

The Office action at page 7, paragraph 11, recites:

> 11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

Applicant respectfully traverses the rejection of claim 8.

More specifically, the Office action, at page 7, paragraph 12, recites:

> As to claims 8 and 28, Madden shows creating the at least one extensible index in response to a type of content indexed [creating a sensors table in response to light and temperature readings selected as a type of content requested from sensors (section 3.1 paragraph 3)].

Madden at section 3.1, paragraph 3 recites:

> Note that the sensors table is (conceptually) an unbounded, continuous data stream of values; as is the case in other streaming and online systems, certain blocking operations (such as sort and symmetric join) are not allowed over such streams unless a bounded subset of the stream, or window, is specified. Windows in TinyDB are defined as fixed-size materialization points over the sensor streams. Such materialization points accumulate a small buffer of data that may be used in other queries. Consider, as an example:
>
> CREATE
> STORAGE POINT recentlight SIZE 8
> AS (SELECT nodeid, light FROM sensors SAMPLE INTERVAL 10s)

Claim 8 recites, "creating the at least one extensible index in response to a type of content indexed." In contrast to claim 8, Madden et al., at section 3.1, paragraph 3 recites, "Note that the sensors table is (conceptually) an unbounded, continuous data stream of values . . . ." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 8, "creating the at least one extensible index in response to a type of content indexed." Further, the Office action has supplied no text, reference, or

knowledge explaining why one skilled in the art should equate any recitations of Madden et al. with "index," as recited in claim 8. Hence, the Office action fails to show how Madden et al. teaches or suggests, "creating the at least one extensible index in response to a type of content indexed." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 8. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 8.

5. Dependent Claim 9 -- Independently Patentable

Claim 9 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 9.

Claim 1 recites:

> 1. A method comprising:
> determining at least one of a sensing function or a control function at a mote; and
> creating one or more mote-addressed content indexes in response to said determining.

Claim 9 is dependent on claim 1. Claim 9 recites:

> 9. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
> creating at least one of a mote-addressed sensing index or a mote-addressed control index.

The Office action at page 7, paragraph 11, recites:

> 11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action at page 7, paragraph 12, recites:

As to claims 9 and 29, Madden shows creating at least one a mote-addressed sensing index [a sensor table of sensors' readings (section 3.1 paragraph 3)].

Madden at section 3.1, paragraph 3 recites:

Note that the sensors table is (conceptually) an unbounded, continuous data stream of values; as is the case in other streaming and online systems, certain blocking operations (such as sort and symmetric join) are not allowed over such streams unless a bounded subset of the stream, or window, is specified. Windows in TinyDB are defined as fixed-size materialization points over the sensor streams. Such materialization points accumulate a small buffer of data that may be used in other queries. Consider, as an example:

CREATE
STORAGE POINT recentlight SIZE 8
AS (SELECT nodeid, light FROM sensors SAMPLE INTERVAL 10s)

Claim 9 recites, "creating at least one of a mote-addressed sensing index or a mote-addressed control index." In contrast to claim 9, Madden et al., at section 3.1, paragraph 3 recites, "Note that the sensors table is (conceptually) an unbounded, continuous data stream of values . . . ." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 9, "creating at least one of a mote-addressed sensing index or a mote-addressed control index." Further, the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate any recitations of Madden et al. with "sensing index" or "control index," as recited in claim 9. Hence, the Office action fails to show how Madden et al. teaches or suggests, "creating at least one of a mote-addressed sensing index or a mote-addressed control index." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 9. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 9.

6. Dependent Claim 10 -- Independently Patentable

Claim 10 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 10.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

10. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
creating at least one of a mote-addressed routing/spatial index.

The Office action at page 7, paragraph 11, recites:

11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

Applicant respectfully traverses the rejection of claim 10.

More specifically, the Office action, at page 7, paragraph 12, recites:

As to claims 10 and 30, Madden shows creating at least one of a mote-addressed routing/spatial index [a list of neighbors and some routing information about the connectivity of those neighbors to the rest of the network (section 2.2 Communication in Sensor Networks, paragraph 2)].

Madden at section 2.2 Communication in Sensor Networks, paragraph 2 recites:

> The requirement that sensor networks be low maintenance and easy to deploy means that communication topologies must be automatically discovered (i.e. ad-hoc) by the devices rather than fixed at the time of network deployment. Typically, devices keep a short list of neighbors who they have heard transmit recently, as well as some routing information about the connectivity of those neighbors to the rest of the network. To assist in making intelligent routing decisions, nodes associate a link quality with each of their neighbors.

Claim 10 recites, "creating at least one of a mote-addressed routing/spatial index." In contrast to claim 10, Madden et al., at section 2.2, recites, "Typically, devices keep a short list of neighbors who they have heard transmit recently, as well as some routing information about the connectivity of those neighbors to the rest of the network." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 10, "creating at least one of a mote-addressed routing/spatial index." Further, the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate any recitations of Madden et al. with "routing index" or "spatial index," as recited in claim 10. Hence, the Office action fails to show how Madden et al. teaches or suggests, "creating at least one of a mote-addressed routing/spatial index." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 10. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 10.

7. Dependent Claim 11 -- Independently Patentable

Claim 11 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 11.

Claim 1 recites:

1. A method comprising:

determining at least one of a sensing function or a control function at a mote; and

creating one or more mote-addressed content indexes in response to said determining.

Claim 11 is dependent on claim 1. Claim 11 recites:

11. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:

inserting at least one device identifier in the one or more mote-addressed content indexes.

The Office action, at page 7, paragraph 11, recites:

11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action at page 9 and page 10, paragraph 14, recites:

As to claims 11 and 31, Madden shows inserting at least one device identifier in the one or more mote-addressed content indexes [nodeid that is selected to be reported in the sensors table (section 3.1, see the first query)].

Madden in section 3.1, first query recites:

Queries in TinyDB, as in SQL, consist of a SELECT-FROM-WHERE clause supporting selection, join, projection, and aggregation. We also include explicit support for sampling, windowing, and sub-queries via materialization points. As is the case in the Cougar and TAG work [41, 34], we view sensor data as a single table with one column per sensor type. Tuples are appended to this table periodically, at well-defined sample intervals that are a parameter of the query. The period of time between each sample interval is known as an epoch. As we discuss in Section 6, epochs provide a convenient mechanism for structuring computation to minimize power consumption. Consider the query:
SELECT nodeid, light, temp FROM sensors
SAMPLE INTERVAL is FOR lOs
This query specifies that each sensor should report its own id, light, and temperature readings (contained in the virtual table sensors) once per second for 10 seconds. Results of this query stream to the root of the

> network in an online fashion, via the multi-hop topology, where they may be logged or output to the user. The output consists of a sequence of tuples, clustered into Is time intervals. Each tuple includes a time stamp corresponding to the time it was produced.

Claim 11 recites, "inserting at least one device identifier in the one or more mote-addressed content indexes." In contrast to claim 11, Madden et al., at section 3.1, recites, "we view sensor data as a single table." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 11, "inserting at least one device identifier in the one or more mote-addressed content indexes." Hence, the Office action fails to show how Madden et al. teaches or suggests, "inserting at least one device identifier in the one or more mote-addressed content indexes." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 11. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 11.

8. Dependent Claims 12, 14-15, and 18-20

Claims 12, 14-15, and 18-20 were rejected under 35 U.S.C. § 102(a) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claims 12, 14-15, and 18-20.

Claims 12, 14-15, and 18-20 are dependent on claim 1. For reasons analogous to those stated above with respect to claim 1, Applicant respectfully submits that the Office action fails to state a *prima facie* case of anticipation with respect to claim 1. Therefore, Applicant requests withdrawal of the rejections and reconsideration and allowance of claims 12, 14-15, and 18-20.

9. Dependent Claim 12 -- Independently Patentable

Claim 12 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 12.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 12 is dependent on claim 1. Claim 12 recites:

12. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
establishing an index-creating agent at the mote;
determining a mote-network address of the mote; and
associating at least one of a mote-addressed sensing index, a mote-addressed control index, or a mote-addressed routing/spatial index with the mote-network address of the mote.

The Office action, at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

More specifically, the Office action, at page 9, paragraph 12, recites:

As to claims 12 and 32, Mulgund shows establishing an index-creating agent at the mote [causing the network modeling agent to visit a first sensor node and mark the first node visited (paragraph 0007). Note that terms "node" and "mote" are interpreted to have same meaning of small embedded platform that has one or more sensors (paragraph 0026) and therefore these terms are used here interchangeably];
determining a mote-network address of the mote (paragraphs [0021] and [0028] – [0031]); and
associating at least one of a mote-addressed sensing index, a mote-addressed control index, or a mote-addressed routing/spatial index with the mote-network address of the mote (Fig. 3 and paragraph [0037]).

Mulgund at paragraphs 0007, 0026, 0021, 0028-0031, and 0037 recites:

[0007] In another aspect, the present invention is a method of database modeling that makes it possible to create, store, and update a virtual model of a network of sensors within a relational database structure. The network modeling agent dynamically updates various sensor node data and link data that collectively define an instantaneous "state" of the sensor network into the database logical design. The network modeling agent thereby facilitates access, visualization, and the use of a stream of information generated by the network of distributed sensors. The sensor nodes to be interrogated by the network modeling agent are assumed to be uniquely addressable and in communication, using networking protocols, with one another through links and with a database server through one or more access points. A method according to the present invention comprises the steps of discovering and maintaining the distributed sensor network topology by applying at every access point a quasi-recursive algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and push it onto the stack. The network modeling agent builds the database model by updating relational database logical design tables at each step of the discovering step. The agent maintains the database model by periodically reapplying the interrogating algorithm, thereby updating the database model to account for sensor node and link additions and deletions. The periodicity of updates is preferably such that a near real-time topology of the sensor network is maintained.

[0026] FIG. 2 illustrates the nature of each of the sensing nodes 2, which comprise computational devices (possibly ranging in complexity from small embedded platforms to a fully-fledged PCs) that have one or more sensors 16 providing high-value information connected to it. The term sensor is used here in a general sense. A sensor 16 as contemplated herein could be as simple as an instrument that measures temperature, pressure, or any such other physical quantity. It could also be a device as complex as a video camera providing continuous full-motion imagery of some area of interest. In any case, the output of each of these sensors 16 is stored locally in a well-defined knowledge base 18, but the output can be accessed from outside the network 4 through some software application programming interface (API) and hardware implementation. Each of the sensing nodes 2 is additionally in communication with one or more other sensing nodes through connecting links 3.

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

[0028] each node is addressable from the outside world or from other nodes;
[0029] the structure and nature of the sensor(s) output data is known a priori or it can be retrieved by interrogating the node with which the sensor(s) are associated;
[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;
[0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Claim 12 recites, "establishing an index-creating agent at the mote." In contrast to claim 12, Mulgund et al., at paragraph 7, recites, "In another aspect, the present invention is a method of database modeling that makes it possible to create, store, and update a virtual model of a network of sensors within a relational database structure." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 12, "establishing an index-creating agent at the mote." Hence, the Office action

fails to show how Mulgund et al. teaches or suggests, "establishing an index-creating agent at the mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 12. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 12.

10. Dependent Claim 14 -- Independently Patentable

Claim 14 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 14.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 14 is dependent on claim 1. Claim 14 recites:

14. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
determining a mote-network address of the mote;
determining one or more types of control available from one or more devices of the mote; and
associating the one or more types of control available from one or more devices of the mote with the mote-network address of the mote.

The Office action, at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

More specifically, the Office action, at page 10, paragraph 12, recites:

As to claims 14, 15, 34, and 35, Mulgund shows

determining a mote-network address of the mote (paragraphs [0021] and [0028] – [0031]);

determining one or more types of control and sensing available from one or more devices of the mote (paragraphs [0021] – [0024]) wherein the following data elements are obtained by interrogating a node (paragraph [0044]); and

associating the one or more types of control or sensing available from one or more devices of the mote with the mote-network address of the mote (Fig. 3 and paragraph [0037]).

Mulgund at paragraphs 0021, 0028-0031, 0021-0024, 0044, and 0037 recites:

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

[0028] each node is addressable from the outside world or from other nodes;
[0029] the structure and nature of the sensor(s) output data is known a priori or it can be retrieved by interrogating the node with which the sensor(s) are associated;
[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;
[0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;
[0022] a connectivity of each of the sensing nodes 2; i.e., a structural representation of the network topology that could be used to reconstruct a diagram such as FIG. 1;
[0023] an up-to-date information content at each of the sensing nodes 2; i.e., a real-time snapshot and time-history of the data of interest generated at each node location by an attached suite of sensors 16, as depicted in FIG. 2; and
[0024] a history of the network 4 from the moment the model was first constructed, which would allow a reconstruction of the network's state at any time in the past.

[0044] To build the database representation of the sensor network 4 described above, the NMA 14 employs a means to traverse the network in order to interrogate each node. The NMA 14 employs a quasi-recursive algorithm that is run on the database server 10 to build and maintain the database network model. The NMA 14 is a software agent resident on the database server 10 and written in any compatible computer language, whose responsibility is to build and update this model. As discussed earlier, it is assumed that there exists some software API that allows the NMA 14 to access each node on the network, which is reached via one or more access points 6 that can be reached via Internet protocols from the database server 10.

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Claim 14 recites, "associating the one or more types of control available from one or more devices of the mote with the mote-network address of the mote."

In contrast to claim 14, Mulgund et al., at paragraph 0037, recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever

reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 14, "associating the one or more types of control available from one or more devices of the mote with the mote-network address of the mote." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "associating the one or more types of control available from one or more devices of the mote with the mote-network address of the mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 14. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 14.

11. Dependent Claim 15 -- Independently Patentable

Claim 15 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 15.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 15 is dependent on claim 1. Claim 15 recites:

15. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
determining a mote-network address of the mote;
determining one or more types of sensing available from one or more devices of the mote; and
associating the one or more types of sensing available from one or more devices of the mote with the mote-network address of the mote.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

Applicant respectfully traverses the rejection of claim 15.

More specifically, the Office action, at page 10, paragraph 12, recites:

As to claims 14, 15, 34, and 35, Mulgund shows determining a mote-network address of the mote (paragraphs [0021] and [0028] – [0031]);

determining one or more types of control and sensing available from one or more devices of the mote (paragraphs [0021] – [0024]) wherein the following data elements are obtained by interrogating a node (paragraph [0044]); and

associating the one or more types of control or sensing available from one or more devices of the mote with the mote-network address of the mote (Fig. 3 and paragraph [0037]).

Mulgund at paragraphs 0021, 0028-0031, 0021-0024, 0044, and 0037 recites:

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

[0028] each node is addressable from the outside world or from other nodes;
[0029] the structure and nature of the sensor(s) output data is known a priori or it can be retrieved by interrogating the node with which the sensor(s) are associated;
[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;
[0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;
[0022] a connectivity of each of the sensing nodes 2; i.e., a structural representation of the network topology that could be used to reconstruct a diagram such as FIG. 1;
[0023] an up-to-date information content at each of the sensing nodes 2; i.e., a real-time snapshot and time-history of the data of interest generated at each node location by an attached suite of sensors 16, as depicted in FIG. 2; and
[0024] a history of the network 4 from the moment the model was first constructed, which would allow a reconstruction of the network's state at any time in the past.

[0044] To build the database representation of the sensor network 4 described above, the NMA 14 employs a means to traverse the network in order to interrogate each node. The NMA 14 employs a quasi-recursive algorithm that is run on the database server 10 to build and maintain the database network model. The NMA 14 is a software agent resident on the database server 10 and written in any compatible computer language, whose responsibility is to build and update this model. As discussed earlier, it is assumed that there exists some software API that allows the NMA 14 to access each node on the network, which is reached via one or more access points 6 that can be reached via Internet protocols from the database server 10.

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Claim 15 recites, "associating the one or more types of sensing available from one or more devices of the mote with the mote-network address of the mote."

In contrast to claim 15, Mulgund et al., at paragraph 0037, recites:

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 15, "associating the one or more types of sensing available from one or more devices of the mote with the mote-network address of the mote." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "associating the one or more types of sensing available from one or more devices of the mote with the mote-network address of the mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 15. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 15.

12. Dependent Claim 18 -- Independently Patentable

Claim 18 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 18.

Claim 1 recites:

1. A method comprising:

determining at least one of a sensing function or a control function at a mote; and

creating one or more mote-addressed content indexes in response to said determining.

Claim 18 is dependent on claim 1. Claim 18 recites:

18. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:

associating one or more mote-appropriate routing addresses with the one or more mote-addressed content indexes.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

More specifically, the Office action, at page 10, paragraph 12, recites:

As to claims 18-20 and 38-40, Mulgund shows associating one or more mote-appropriate routing addresses [note addresses (see table 20 of Fig. 3)] with at least one mote-addressed content index (Fig. 3 and Fig. 4, paragraphs [0037]-[0038]) wherein mote-addressed content index could be addressed directly or indirectly depending on the implementation (paragraph [0042]).

Mulgund at paragraphs 0037 and 0038 recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

And Mulgund at paragraph 0042 recites:

[0042] In another embodiment, the database logical design 19 further comprises a Data Table List 30 that provides a mapping between individual nodes 2 and the names of the tables used to store those nodes' Sensor Data. Each of these tables is defined and created dynamically, based on the structure of the information at each node. FIG. 4 illustrates an embodiment of a network model logical design 19 for a three-node network configuration wherein each of the three nodes (A, B, C) provides a different amount of data. As such a network is traversed and the Nodes Table 20 is populated, an entry is made in the Data Table List Table 30 that identifies the name of the table associated with a given node. In the example illustrated, each node (A, B, C) has its own Node Data Table (27A-C). Each of Node Data Table is defined to accommodate the type of sensor data known to originate from that node. As discussed earlier, it is assumed that the software agent on the database server can interrogate the node to determine what type of information it provides, and then define the table structures accordingly.

Claim 18 recites, "associating one or more mote-appropriate routing addresses with the one or more mote-addressed content indexes."

In contrast to claim 18, Mulgund et al., at paragraphs 0037 and 0038, recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 18, "associating one or more mote-appropriate routing addresses with the one or more mote-addressed content indexes." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "associating one or more mote-appropriate routing addresses with the one or more mote-addressed content indexes." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 18. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 18.

13. Dependent Claim 19 -- Independently Patentable

Claim 19 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 19.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 19 is dependent on claim 1. Claim 19 recites:

19. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
associating one or more mote-appropriate routing addresses with at least one directly mote-addressed content index.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

Applicant respectfully traverses the rejection of claim 19.

More specifically, the Office action, at page 10, paragraph 12, recites:

As to claims 18-20 and 38-40, the claims will be interpreted broadly since the meaning of the claimed limitations is not understood.
As to claims 18-20 and 38-40, Mulgund shows associating one or more mote-appropriate routing addresses [note addresses (see table 20 of Fig. 3)] with at least one mote-addressed content index (Fig. 3 and Fig. 4, paragraphs [0037]-[0038]) wherein mote-addressed content index could be addressed directly or indirectly depending on the implementation (paragraph [0042]).

Mulgund at paragraphs 0037 and 0038 recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

And Mulgund at paragraph 0042 recites:

[0042] In another embodiment, the database logical design 19 further comprises a Data Table List 30 that provides a mapping between individual nodes 2 and the names of the tables used to store those nodes' Sensor Data. Each of these tables is defined and created dynamically, based on the structure of the information at each node. FIG. 4 illustrates an embodiment of a network model logical design 19 for a three-node network configuration wherein each of the three nodes (A, B, C) provides a different amount of data. As such a network is traversed and the Nodes Table 20 is populated, an entry is made in the Data Table List Table 30

that identifies the name of the table associated with a given node. In the example illustrated, each node (A, B, C) has its own Node Data Table (27A-C). Each of Node Data Table is defined to accommodate the type of sensor data known to originate from that node. As discussed earlier, it is assumed that the software agent on the database server can interrogate the node to determine what type of information it provides, and then define the table structures accordingly.

Claim 19 recites, "associating one or more mote-appropriate routing addresses with at least one directly mote-addressed content index."

In contrast to claim 19, Mulgund et al., at paragraphs 0037 and 0038, recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 19, "associating one or more mote-appropriate routing addresses with at least one directly mote-addressed content index." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, " associating one or more mote-appropriate routing addresses with at least one directly mote-addressed content index." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 19. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 19.

14. Dependent Claim 20 -- Independently Patentable

Claim 20 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 20.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 20 is dependent on claim 1. Claim 20 recites:

20. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
associating one or more mote-appropriate routing addresses with at least one indirectly mote-addressed content index.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

More specifically, the Office action, at page 10, paragraph 12, recites:

As to claims 18-20 and 38-40, the claims will be interpreted broadly since the meaning of the claimed limitations is not understood.
As to claims 18-20 and 38-40, Mulgund shows associating one or more mote-appropriate routing addresses [node addresses (see table 20 of Fig. 3)] with at least one mote-addressed content index (Fig. 3 and Fig. 4, paragraphs [0037]-[0038]) wherein mote-addressed content index could be addressed directly or indirectly depending on the implementation (paragraph [0042]).

Mulgund at paragraphs 0037 and 0038 recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure

to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

And Mulgund at paragraph 0042 recites:

> [0042] In another embodiment, the database logical design 19 further comprises a Data Table List 30 that provides a mapping between individual nodes 2 and the names of the tables used to store those nodes' Sensor Data. Each of these tables is defined and created dynamically, based on the structure of the information at each node. FIG. 4 illustrates an embodiment of a network model logical design 19 for a three-node network configuration wherein each of the three nodes (A, B, C) provides a different amount of data. As such a network is traversed and the Nodes Table 20 is populated, an entry is made in the Data Table List Table 30 that identifies the name of the table associated with a given node. In the example illustrated, each node (A, B, C) has its own Node Data Table (27A-C). Each of Node Data Table is defined to accommodate the type of sensor data known to originate from that node. As discussed earlier, it is assumed that the software agent on the database server can interrogate the node to determine what type of information it provides, and then define the table structures accordingly.

Claim 20 recites, "associating one or more mote-appropriate routing addresses with at least one indirectly mote-addressed content index."

In contrast to claim 20, Mulgund et al., at paragraphs 0037 and 0038, recites:

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

> [0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 20, "associating one or more mote-appropriate routing addresses with at least one indirectly mote-addressed content index." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "associating one or more mote-appropriate routing addresses with at least one indirectly mote-addressed content index." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 20. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 20.

15. Independent Claim 21

Claim 21 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 21.

Claim 21 recites:

21. A system comprising:

means for determining at least one of a sensing function or a control function at a mote; and

means for creating one or more mote-addressed content indexes in response to said determining.

The Office action at page 7, paragraph 11, recites:

11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action at page 7, paragraph 11, recites:

As to claims 1 and 21, Madden et al. shows
determining at least one of a sensing function or a control function at a mote [sampling a sensor s to evaluate any predicate over the attribute sensors (section 4.2 Ordering of Sampling And Predicates)]; and
creating one or more mote-addressed content indexes in response to said determining [creating and maintaining a catalog of metadata that describes a particular mote's local attributes, events, and information about the costs of processing and delivering data (section 4.1 Metadata Management, and Table 2, and 3)].
Madden also shows that recited functions are performed by a TinyDB (section 1 Introduction, paragraph 4).

Claim 21 recites, "means for determining at least one of a sensing function or a control function at a mote." In contrast, "sampling a sensor s to evaluate any predicate over the attribute sensor" at section 4.2 of Madden et al., which is recited in the Office action in support of the rejection fails to recite, "means for determining at least one of a sensing function or a control function at a mote," as recited in claim 21. Further, based on an analysis of the Office action, the above quoted recitation from Madden et al., and claim 21, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. with the recitation of claim 21, "means for determining at least one of a sensing function or a control function at a mote." Hence, the Office action fails to show how Madden et al. teaches or suggests "means for determining

at least one of a sensing function or a control function at a mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 21. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 21.

Claim 21 recites, "means for creating one or more mote-addressed content indexes in response to said determining." The Office action cites to paragraph 4.1 of Madden in support of the rejection of claim 21. However, in contrast to claim 21, Madden et al., at paragraph 4.1, recites, "Each node in Tiny DB maintains a catalog of metadata that describes its local attributes, events, and user-defined functions." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 21, "means for creating one or more mote-addressed content indexes in response to said determining." Further, for the material cited, the Office action has supplied not text, reference, or knowledge explaining why one skilled in the are should equate "catalog" with "index" or "maintains" with "creating." Hence, the Office action fails to show how Madden et al. teaches or suggests "means for creating one or more mote-addressed content indexes in response to said determining." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 21. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 21.

Claim 21 was rejected under 35 U.S.C. § 102(a) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 21.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

More specifically, the Office action at page 9, paragraph 12, recites:

As to claims 1 and 21, Mulgund shows

determining at least one of a sensing function or a control function at a mote [discovering and maintaining the distributed sensor network topology (paragraph [0007]) wherein at least one of a sensing function or a control function is interpreted to be at least one of the data elements outlined in paragraphs 0021 – 0024]; and
creating one or more mote-addressed content indexes in response to said determining [building a database model by updating relational database logical design tables at each step of the discovering step (paragraph 0007)].
Mulgund also shows a sensor network modeling agent (summary of the invention) for performing the recited functions.

Mulgund at paragraphs 0007, 0021-0024, and "summary" recites:

[0007] In another aspect, the present invention is a method of database modeling that makes it possible to create, store, and update a virtual model of a network of sensors within a relational database structure. The network modeling agent dynamically updates various sensor node data and link data that collectively define an instantaneous "state" of the sensor network into the database logical design. The network modeling agent thereby facilitates access, visualization, and the use of a stream of information generated by the network of distributed sensors. The sensor nodes to be interrogated by the network modeling agent are assumed to be uniquely addressable and in communication, using networking protocols, with one another through links and with a database server through one or more access points. A method according to the present invention comprises the steps of discovering and maintaining the distributed sensor network topology by applying at every access point a quasi-recursive algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and push it onto the stack. The network modeling agent builds the database model by updating relational database logical design tables at each step of the discovering step. The agent maintains the database model by periodically reapplying the interrogating algorithm, thereby updating the database model to account for sensor node and link additions and deletions. The periodicity of updates is preferably such that a near real-time topology of the sensor network is maintained.

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;
[0022] a connectivity of each of the sensing nodes 2; i.e., a structural representation of the network topology that could be used to reconstruct a diagram such as FIG. 1;
[0023] an up-to-date information content at each of the sensing nodes 2; i.e., a real-time snapshot and time-history of the data of interest generated at each node location by an attached suite of sensors 16, as depicted in FIG. 2; and
[0024] a history of the network 4 from the moment the model was first constructed, which would allow a reconstruction of the network's state at any time in the past.

[0006] In one aspect, the present invention is an information architecture that permits the Internet to contact distributed sensors at one point, databases and mining engines at another point, and users at another point. In this aspect, the invention is an enabling interface between the Internet and

the physical world. Due to the global reach of the Internet, these physical points of contact may be distributed anywhere in the world. The Applicants have invented a sensor network modeling agent for use with a relational database and a logical design resident therein.
[0007] In another aspect, the present invention is a method of database modeling that makes it possible to create, store, and update a virtual model of a network of sensors within a relational database structure. The network modeling agent dynamically updates various sensor node data and link data that collectively define an instantaneous "state" of the sensor network into the database logical design. The network modeling agent thereby facilitates access, visualization, and the use of a stream of information generated by the network of distributed sensors. The sensor nodes to be interrogated by the network modeling agent are assumed to be uniquely addressable and in communication, using networking protocols, with one another through links and with a database server through one or more access points. A method according to the present invention comprises the steps of discovering and maintaining the distributed sensor network topology by applying at every access point a uqasi-recursive algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and

push it onto the stack. The network modeling agent builds the database model by updating relational database logical design tables at each step of the discovering step. The agent maintains the database model by periodically reapplying the interrogating algorithm, thereby updating the database model to account for sensor node and link additions and deletions. The periodicity of updates is preferably such that a near real-time topology of the sensor network is maintained.

[0008] In another embodiment, the present invention is a method as described above, wherein the logical design tables further comprise a data table for mapping between one or more sensor nodes and the tables used to store the associated sensor output data associated with the one or more sensor nodes.

[0009] In certain embodiments, the present invention is used in modeling networks comprised of mobile sensor nodes. The sensor nodes may communicate by wired or wireless means. The database server used with the present invention may be remotely located from the distributed sensor network.

Claim 21 recites, "means for determining at least one of a sensing function or a control function at a mote." In contrast, Mulgund et al., at paragraph 0007 recites:

> A method according to the present invention comprises the steps of discovering and maintaining the distributed sensor network topology by applying at every access point a quasi-recursive algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and push it onto the stack.

Based on an analysis of the Office action, the above quoted citation from Mulgund et al., and claim 21, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. with the recitation of claim 21, "means for determining at least one of a sensing function or a control function at a mote." Further, for the quoted material, the Office action has supplied not text, reference, or knowledge explaining why one skilled in the art should equate "discovering and

maintaining the distributed sensor network topology" as recited in Mulgund et al. with "means for determining at least one of a sensing function or a control function at a mote" as recited in claim 21. Further, Mulgund et al. recites "discovering" a "network topology," while claim 21 recites, "means for determining at least one of a sensing function or a control function at a mote." And the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate "discovering" and "network topology" with "means for determining at least one of a sensing function or a control function at a mote" as recited in claim 21. Hence, the Office action fails to show how Mulgund et al. teaches or suggests "determining at least one of a sensing function or a control function at a mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 21. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 21.

Claim 21 recites, "means for creating one or more mote-addressed content indexes in response to said determining." In contrast to claim 21, Mulgund et al., at paragraph 007 recites, "The network modeling agent builds the database model by updating relational database logical design tables at each step of the discovering step." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 21, "means for creating one or more mote-addressed content indexes in response to said determining." Further, for the material cited, the Office action has supplied not text, reference, or knowledge explaining why one skilled in the are should equate "database model" with "mote-addressed content indexes." Hence, the Office action fails to show how Madden et al. teaches or suggests "means for creating one or more mote-addressed content indexes in response to said determining." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 21. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 21.

16. Dependent claims 27-31

Claims 27-31 were rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden *et al.* Applicant respectfully traverses the rejection of claims 27-31.

Claims 27-31 are dependent on claim 1. For reasons analogous to those stated above with respect to claim 1, Applicant respectfully submits that the Office action fails to state a *prima facie* case of anticipation with respect to claims 27-31. Therefore, Applicant requests withdrawal of the rejections and reconsideration and allowance of claims 27-31.

17. Dependent Claim 27 - Independently Patentable

Claim 27 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 27.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 27 is dependent on claim 21. Claim 27 recites:

27. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:
means for creating at least one extensible index.

The Office action at page 7, paragraph 11, recites:

11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

Applicant respectfully traverses the rejection of claim 27.

More specifically, the Office action at page 8, paragraph 11, recites:

As to claims 7 and 27, Madden shows creating at least one extensible index [a sensors table, which is conceptually unbounded (section 3.1 paragraph 3)].

Madden at section 3.1, paragraph 3 recites:

Note that the sensors table is (conceptually) an unbounded, continuous data stream of values; as is the case in other streaming and online systems, certain blocking operations (such as sort and symmetric join) are not allowed over such streams unless a bounded subset of the stream, or window, is specified. Windows in TinyDB are defined as fixed-size materialization points over the sensor streams. Such materialization points accumulate a small buffer of data that may be used in other queries. Consider, as an example:

```
CREATE
STORAGE POINT recentlight SIZE 8
AS (SELECT nodeid, light FROM sensors SAMPLE INTERVAL 10s)
```

Claim 27 recites, "means for creating at least one extensible index." In contrast to claim 27, Madden et al., at section 3.1, paragraph 3 recites, "Note that the sensors table is (conceptually) an unbounded, continuous data stream of values . . . ." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 27, "means for creating at least one extensible index." Further, for the material cited, the Office action has supplied not text, reference, or knowledge explaining why one skilled in the are should equate "sensors table" with "extensible index" for "one or more mote-addressed content indexes," as recited in claim 27. Hence, the Office action fails to show how Madden et al. teaches or suggests "means for creating at least one extensible index."

Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 27. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 27.

18. Dependent Claim 28 - Independently Patentable

Claim 28 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 28.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 27 is dependent on claim 21. Claim 27 recites:

27. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:
means for creating at least one extensible index.

Claim 28 is dependent on claim 27. Claim 28 recites:

28. The method of Claim 27, wherein said means for creating at least one extensible index means for creating at least one extensible index further comprises:
means for creating the at least one extensible index in response to a type of content indexed.

The Office action at page 7, paragraph 11, recites:

11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

Applicant respectfully traverses the rejection of claim 28.

More specifically, the Office action, at page 8, paragraph 11, recites:

> As to claims 8 and 28, Madden shows creating the at least one extensible index in response to a type of content indexed [creating a sensors table in response to light and temperature readings selected as a type of content requested from sensors (section 3.1 paragraph 3)].

Madden at section 3.1, paragraph 3 recites:

> Note that the sensors table is (conceptually) an unbounded, continuous data stream of values; as is the case in other streaming and online systems, certain blocking operations (such as sort and symmetric join) are not allowed over such streams unless a bounded subset of the stream, or window, is specified. Windows in TinyDB are defined as fixed-size materialization points over the sensor streams. Such materialization points accumulate a small buffer of data that may be used in other queries. Consider, as an example:
>
> CREATE
> STORAGE POINT recentlight SIZE 8
> AS (SELECT nodeid, light FROM sensors SAMPLE INTERVAL 10s)

Claim 28 recites, "means for creating the at least one extensible index in response to a type of content indexed." In contrast to claim 28, Madden et al., at section 3.1, paragraph 3 recites, "Note that the sensors table is (conceptually) an unbounded, continuous data stream of values . . . ." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 28, "means for creating the at least one extensible index in response to a type of content indexed." Further, the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate any recitations of Madden et al. with "index," as recited in claim 28. Hence, the Office action fails to show how Madden et al. teaches or suggests, "means for creating the at least one extensible index in response to a type of content indexed." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 28.

Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 28.

19. Dependent Claim 29 - Independently Patentable

Claim 29 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 29.

Claim 29 recites:

> 21. A system comprising:
> means for determining at least one of a sensing function or a control function at a mote; and
> means for creating one or more mote-addressed content indexes in response to said determining.
>
> Claim 29 is dependent on claim 21. Claim 29 recites:
>
> 29. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:
> means for creating at least one of a mote-addressed sensing index or a mote-addressed control index.
>
> The Office action at page 7, paragraph 11, recites:
>
> 11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.
>
> Applicant respectfully traverses the rejection of claim 29.
>
> More specifically, the Office action at page 8 and page 11, paragraph 15, recites:
>
> As to claims 9 and 29, Madden shows creating at least one a mote-addressed sensing index [a sensor table of sensors' readings (section 3.1 paragraph 3)].

Madden at section 3.1, paragraph 3 recites:

> Note that the sensors table is (conceptually) an unbounded, continuous data stream of values; as is the case in other streaming and online systems, certain blocking operations (such as sort and symmetric join) are not allowed over such streams unless a bounded subset of the stream, or window, is specified. Windows in TinyDB are defined as fixed-size materialization points over the sensor streams. Such materialization points accumulate a small buffer of data that may be used in other queries. Consider, as an example:
>
> CREATE
> STORAGE POINT recentlight SIZE 8
> AS (SELECT nodeid, light FROM sensors SAMPLE INTERVAL 10s)

Claim 29 recites, "means for creating at least one of a mote-addressed sensing index or a mote-addressed control index." In contrast to claim 29, Madden et al., at section 3.1, paragraph 3 recites, "Note that the sensors table is (conceptually) an unbounded, continuous data stream of values . . . ." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 29, "means for creating at least one of a mote-addressed sensing index or a mote-addressed control index." Further, the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate any recitations of Madden et al. with "sensing index" or "control index," as recited in claim 29. Hence, the Office action fails to show how Madden et al. teaches or suggests, "means for creating at least one of a mote-addressed sensing index or a mote-addressed control index." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 29. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 29.

20. Dependent Claim 30 - Independently Patentable

Claim 30 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 30.

Claim 21 recites:

21. A system comprising:

means for determining at least one of a sensing function or a control function at a mote; and

means for creating one or more mote-addressed content indexes in response to said determining.

Claim 30 is dependent on claim 21. Claim 30 recites:

30. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:

means for creating at least one of a mote-addressed routing/spatial index.

The Office action at page 7, paragraph 11, recites:

11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

Applicant respectfully traverses the rejection of claim 30.

More specifically, the Office action at page 8, paragraph 11.

As to claims 10 and 30, Madden shows creating at least one of a mote-addressed routing/spatial index [a list of neighbors and some routing information about the connectivity of those neighbors to the rest of the network (section 2.2 Communication in Sensor Networks, paragraph 2)].

Madden at section 2.2 Communication in Sensor Networks, paragraph 2 recites:

The requirement that sensor networks be low maintenance and easy to deploy means that communication topologies must be automatically discovered (i.e. ad-hoc) by the devices rather than fixed at the time of network deployment. Typically, devices keep a short list of neighbors who they have heard transmit recently, as well as some routing information about the connectivity of those neighbors to the rest of the network. To assist in making intelligent routing decisions, nodes associate a link quality with each of their neighbors.

Claim 30 recites, "means for creating at least one of a mote-addressed routing/spatial index." In contrast to claim 30, Madden et al., at section 2.2, recites, "Typically, devices keep a short list of neighbors who they have heard transmit recently, as well as some routing information about the connectivity of those neighbors to the rest of the network." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 30, "means for creating at least one of a mote-addressed routing/spatial index." Further, the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate any recitations of Madden et al. with "routing index" or "spatial index," as recited in claim 30. Hence, the Office action fails to show how Madden et al. teaches or suggests, "means creating at least one of a mote-addressed routing/spatial index." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 30. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 30.

21. Dependent Claim 31 - Independently Patentable

Claim 31 was rejected under 35 U.S.C. § 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 31.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 31 is dependent on claim 21. Claim 31 recites:

31. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:

means for inserting at least one device identifier in the one or more mote-addressed content indexes.

The Office action at page 7, paragraph 11, recites:

11. Claims 1, 7-11, 21, and 27-31 are rejected under 35 U.S.C. 102(a) as being anticipated by "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

Applicant respectfully traverses the rejection of claim 31.

More specifically, the Office action at page 8, paragraph 11 recites:

As to claims 11 and 31, Madden shows inserting at least one device identifier in the one or more mote-addressed content indexes [nodeid that is selected to be reported in the sensors table (section 3.1, see the first query)].

Madden in section 3.1, first query recites:

Queries in TinyDB, as in SQL, consist of a SELECT-FROM-WHERE clause supporting selection, join, projection, and aggregation. We also include explicit support for sampling, windowing, and sub-queries via materialization points. As is the case in the Cougar and TAG work [41, 34], we view sensor data as a single table with one column per sensor type. Tuples are appended to this table periodically, at well-defined sample intervals that are a parameter of the query. The period of time between each sample interval is known as an epoch. As we discuss in Section 6, epochs provide a convenient mechanism for structuring computation to minimize power consumption. Consider the query:
SELECT nodeid, light, temp FROM sensors
SAMPLE INTERVAL is FOR lOs
This query specifies that each sensor should report its own id, light, and temperature readings (contained in the virtual table sensors) once per second for 10 seconds. Results of this query stream to the root of the network in an online fashion, via the multi-hop topology, where they may be logged or output to the user. The output consists of a sequence of tuples, clustered into Is time intervals. Each tuple includes a time stamp corresponding to the time it was produced.

Claim 31 recites, "means for inserting at least one device identifier in the one or more mote-addressed content indexes." In contrast to claim 31, Madden et al., at section 3.1, recites, "we view sensor data as a single table." Applicant respectfully submits that

the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. or any other material included in Madden et al. with the recitation of claim 31, "means for inserting at least one device identifier in the one or more mote-addressed content indexes." Hence, the Office action fails to show how Madden et al. teaches or suggests, "means for inserting at least one device identifier in the one or more mote-addressed content indexes." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 31. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 31.

22. Dependent Claims 32, 34-35, and 38-40

Claims 32, 34-35, and 38-40 were rejected under 35 U.S.C. § 102(a) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claims 32, 34-35, and 38-40.

Claims 32, 34-35, and 38-40 are dependent on claim 21. For reasons analogous to those stated above with respect to claim 21, Applicant respectfully submits that the Office action fails to state a *prima facie* case of anticipation with respect to claim 21. Therefore, Applicant requests withdrawal of the rejections and reconsideration and allowance of claims 32, 34-35, and 38-40.

23. Dependent Claim 32 - Independently Patentable

Claim 32 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 32.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 32 is dependent on claim 21. Claim 32 recites:

32. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:

means for establishing an index-creating agent at the mote;

means for determining a mote-network address of the mote; and

means for associating at least one of a mote-addressed sensing index, a mote-addressed control index, or a mote-addressed routing/spatial index with the mote-network address of the mote.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

Applicant respectfully traverses the rejection of claim 32.

More specifically, the Office action at page 9, paragraph 12 recites:

As to claims 12 and 32, Mulgund shows
establishing an index-creating agent at the mote [causing the network modeling agent to visit a first sensor node and mark the first node visited (paragraph 0007). Note that terms "node" and "mote" are interpreted to have same meaning of small embedded platform that has one or more sensors (paragraph 0026) and therefore these terms are used here interchangeably];
determining a mote-network address of the mote (paragraphs [0021] and [0028] – [0031]); and
associating at least one of a mote-addressed sensing index, a mote-addressed control index, or a mote-addressed routing/spatial index with the mote-network address of the mote (Fig. 3 and paragraph [0037]).
Mulgund at paragraphs 0007, 0026, 0021, 0028-0031, and 0037 recites:

[0007] In another aspect, the present invention is a method of database modeling that makes it possible to create, store, and update a virtual model of a network of sensors within a relational database structure. The network modeling agent dynamically updates various sensor node data and link data that collectively define an instantaneous "state" of the sensor network into the database logical design. The network modeling agent thereby facilitates access, visualization, and the use of a stream of information generated by the network of distributed sensors. The sensor nodes to be interrogated by the network modeling agent are assumed to be uniquely

addressable and in communication, using networking protocols, with one another through links and with a database server through one or more access points. A method according to the present invention comprises the steps of discovering and maintaining the distributed sensor network topology by applying at every access point a quasi-recursive algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and push it onto the stack. The network modeling agent builds the database model by updating relational database logical design tables at each step of the discovering step. The agent maintains the database model by periodically reapplying the interrogating algorithm, thereby updating the database model to account for sensor node and link additions and deletions. The periodicity of updates is preferably such that a near real-time topology of the sensor network is maintained.

[0026] FIG. 2 illustrates the nature of each of the sensing nodes 2, which comprise computational devices (possibly ranging in complexity from small embedded platforms to a fully-fledged PCs) that have one or more sensors 16 providing high-value information connected to it. The term sensor is used here in a general sense. A sensor 16 as contemplated herein could be as simple as an instrument that measures temperature, pressure, or any such other physical quantity. It could also be a device as complex as a video camera providing continuous full-motion imagery of some area of interest. In any case, the output of each of these sensors 16 is stored locally in a well-defined knowledge base 18, but the output can be accessed from outside the network 4 through some software application programming interface (API) and hardware implementation. Each of the sensing nodes 2 is additionally in communication with one or more other sensing nodes through connecting links 3.

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

[0028] each node is addressable from the outside world or from other nodes;

> [0029] the structure and nature of the sensor(s) output data is known a priori or it can be retrieved by interrogating the node with which the sensor(s) are associated;
> [0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;
> [0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and
>
> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Claim 32 recites, "means for establishing an index-creating agent at the mote." In contrast to claim 32, Mulgund et al., at paragraph 7, recites, "In another aspect, the present invention is a method of database modeling that makes it possible to create, store, and update a virtual model of a network of sensors within a relational database structure." Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 32, "means for establishing an index-creating agent at the mote." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "means for establishing an index-creating agent at the mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 32. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 32.

24. Dependent Claim 34 - Independently Patentable

Claim 34 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 34.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 34 is dependent on claim 21. Claim 34 recites:

34. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:
means for determining a mote-network address of the mote;
means for determining one or more types of control available from one or more devices of the mote; and
means for associating the one or more types of control available from one or more devices of the mote with the mote-network address of the mote.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

Applicant respectfully traverses the rejection of claim 34.

As to claims 14, 15, 34, and 35, Mulgund shows determining a mote-network address of the mote (paragraphs [0021] and [0028] – [0031]);
determining one or more types of control and sensing available from one or more devices of the mote (paragraphs [0021] – [0024]) wherein the following data elements are obtained by interrogating a node (paragraph [0044]); and
associating the one or more types of control or sensing available from one or more devices of the mote with the mote-network address of the mote (Fig. 3 and paragraph [0037]).

Mulgund at paragraphs 0021, 0028-0031, 0021-0024, 0044, and 0037 recites:

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

[0028] each node is addressable from the outside world or from other nodes;
[0029] the structure and nature of the sensor(s) output data is known a priori or it can be retrieved by interrogating the node with which the sensor(s) are associated;
[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;
[0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;
[0022] a connectivity of each of the sensing nodes 2; i.e., a structural representation of the network topology that could be used to reconstruct a diagram such as FIG. 1;
[0023] an up-to-date information content at each of the sensing nodes 2; i.e., a real-time snapshot and time-history of the data of interest generated at each node location by an attached suite of sensors 16, as depicted in FIG. 2; and
[0024] a history of the network 4 from the moment the model was first constructed, which would allow a reconstruction of the network's state at any time in the past.

[0044] To build the database representation of the sensor network 4 described above, the NMA 14 employs a means to traverse the network in order to interrogate each node. The NMA 14 employs a quasi-recursive algorithm that is run on the database server 10 to build and maintain the database network model. The NMA 14 is a software agent resident on the database server 10 and written in any compatible computer language, whose responsibility is to build and update this model. As discussed earlier, it is assumed that there exists some software API that allows the NMA 14 to access each node on the network, which is reached via one or more access points 6 that can be reached via Internet protocols from the database server 10.

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Claim 34 recites, "means for associating the one or more types of control available from one or more devices of the mote with the mote-network address of the mote."

In contrast to claim 34, Mulgund et al., at paragraph 0037, recites:

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 34, "means for associating the one or more types of control available from one or more devices of the mote with the mote-network address of the mote." Hence, the

Office action fails to show how Mulgund et al. teaches or suggests, "means for associating the one or more types of control available from one or more devices of the mote with the mote-network address of the mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 34. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 34.

25. Dependent Claim 35 - Independently Patentable

Claim 35 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 35.

Claim 21 recites:

> 21. A system comprising:
> means for determining at least one of a sensing function or a control function at a mote; and
> means for creating one or more mote-addressed content indexes in response to said determining.

Claim 35 is dependent on claim 21. Claim 35 recites:

> 35. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:
> means for determining a mote-network address of the mote;
> means for determining one or more types of sensing available from one or more devices of the mote; and
> means for associating the one or more types of sensing available from one or more devices of the mote with the mote-network address of the mote.

The Office action at page 9, paragraph 12, recites:

> 12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161-751).

Applicant respectfully traverses the rejection of claim 35.

More specifically, the Office action at page 10, paragraph 12 recites:

> As to claims 14, 15, 34, and 35, Mulgund shows determining a mote-network address of the mote (paragraphs [0021] and [0028] – [0031]);
>
> determining one or more types of control and sensing available from one or more devices of the mote (paragraphs [0021] – [0024]) wherein the following data elements are obtained by interrogating a node (paragraph [0044]); and
>
> associating the one or more types of control or sensing available from one or more devices of the mote with the mote-network address of the mote (Fig. 3 and paragraph [0037]).

Mulgund at paragraphs 0021, 0028-0031, 0021-0024, 0044, and 0037 recites:

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

[0028] each node is addressable from the outside world or from other nodes;
[0029] the structure and nature of the sensor(s) output data is known a priori or it can be retrieved by interrogating the node with which the sensor(s) are associated;
[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;
[0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;
[0022] a connectivity of each of the sensing nodes 2; i.e., a structural representation of the network topology that could be used to reconstruct a diagram such as FIG. 1;
[0023] an up-to-date information content at each of the sensing nodes 2; i.e., a real-time snapshot and time-history of the data of interest generated at each node location by an attached suite of sensors 16, as depicted in FIG. 2; and

[0024] a history of the network 4 from the moment the model was first constructed, which would allow a reconstruction of the network's state at any time in the past.

[0044] To build the database representation of the sensor network 4 described above, the NMA 14 employs a means to traverse the network in order to interrogate each node. The NMA 14 employs a quasi-recursive algorithm that is run on the database server 10 to build and maintain the database network model. The NMA 14 is a software agent resident on the database server 10 and written in any compatible computer language, whose responsibility is to build and update this model. As discussed earlier, it is assumed that there exists some software API that allows the NMA 14 to access each node on the network, which is reached via one or more access points 6 that can be reached via Internet protocols from the database server 10.

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Claim 35 recites, "means for associating the one or more types of sensing available from one or more devices of the mote with the mote-network address of the mote."

In contrast to claim 35, Mulgund et al., at paragraph 0037, recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this

Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 35, "means for associating the one or more types of sensing available from one or more devices of the mote with the mote-network address of the mote." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "means for associating the one or more types of sensing available from one or more devices of the mote with the mote-network address of the mote." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 35. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 35.

26. Dependent Claim 38 - Independently Patentable

Claim 38 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 38.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 38 is dependent on claim 21. Claim 38 recites:

38. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:

means for associating one or more mote-appropriate routing addresses with the one or more mote-addressed content indexes.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

Applicant respectfully traverses the rejection of claim 38.

More specifically, the Office action at page 10, paragraph 12 recites:

As to claims 18-20 and 38-40, Mulgund shows associating one or more mote-appropriate routing addresses [note addresses (see table 20 of Fig. 3)] with at least one mote-addressed content index (Fig. 3 and Fig. 4, paragraphs [0037]-[0038]) wherein mote-addressed content index could be addressed directly or indirectly depending on the implementation (paragraph [0042]).

Mulgund at paragraphs 0037 and 0038 recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints

exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

And Mulgund at paragraph 0042 recites:

[0042] In another embodiment, the database logical design 19 further comprises a Data Table List 30 that provides a mapping between individual nodes 2 and the names of the tables used to store those nodes' Sensor Data. Each of these tables is defined and created dynamically, based on the structure of the information at each node. FIG. 4 illustrates an embodiment of a network model logical design 19 for a three-node network configuration wherein each of the three nodes (A, B, C) provides a different amount of data. As such a network is traversed and the Nodes Table 20 is populated, an entry is made in the Data Table List Table 30 that identifies the name of the table associated with a given node. In the example illustrated, each node (A, B, C) has its own Node Data Table (27A-C). Each of Node Data Table is defined to accommodate the type of sensor data known to originate from that node. As discussed earlier, it is assumed that the software agent on the database server can interrogate the node to determine what type of information it provides, and then define the table structures accordingly.

Claim 38 recites, "means for associating one or more mote-appropriate routing addresses with the one or more mote-addressed content indexes."

In contrast to claim 38, Mulgund et al., at paragraphs 0037 and 0038, recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was

> last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.
>
> [0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 38, "means for associating one or more mote-appropriate routing addresses with the one or more mote-addressed content indexes." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "means for associating one or more mote-appropriate routing addresses with the one or more mote-addressed content indexes." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 38. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 38.

27. Dependent Claim 39 - Independently Patentable

Claim 39 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 39.

Claim 21 recites:

21. A system comprising:

means for determining at least one of a sensing function or a control function at a mote; and

means for creating one or more mote-addressed content indexes in response to said determining.

39. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:
means for associating one or more mote-appropriate routing addresses with at least one directly mote-addressed content index.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

Applicant respectfully traverses the rejection of claim 39.

More specifically, the Office action at page 10, paragraph 12 recites:

As to claims 18-20 and 38-40, Mulgund shows associating one or more mote-appropriate routing addresses [note addresses (see table 20 of Fig. 3)] with at least one mote-addressed content index (Fig. 3 and Fig. 4, paragraphs [0037]-[0038]) wherein mote-addressed content index could be addressed directly or indirectly depending on the implementation (paragraph [0042]).

Mulgund at paragraphs 0037 and 0038 recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

> [0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

And Mulgund at paragraph 0042 recites:

> [0042] In another embodiment, the database logical design 19 further comprises a Data Table List 30 that provides a mapping between individual nodes 2 and the names of the tables used to store those nodes' Sensor Data. Each of these tables is defined and created dynamically, based on the structure of the information at each node. FIG. 4 illustrates an embodiment of a network model logical design 19 for a three-node network configuration wherein each of the three nodes (A, B, C) provides a different amount of data. As such a network is traversed and the Nodes Table 20 is populated, an entry is made in the Data Table List Table 30 that identifies the name of the table associated with a given node. In the example illustrated, each node (A, B, C) has its own Node Data Table (27A-C). Each of Node Data Table is defined to accommodate the type of sensor data known to originate from that node. As discussed earlier, it is assumed that the software agent on the database server can interrogate the node to determine what type of information it provides, and then define the table structures accordingly.

Claim 39 recites, "means for associating one or more mote-appropriate routing addresses with at least one directly mote-addressed content index."

In contrast to claim 39, Mulgund et al., at paragraphs 0037 and 0038, recites:

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.
>
> [0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 39, "means for associating one or more mote-appropriate routing addresses with at least one directly mote-addressed content index." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "means for associating one or more mote-appropriate routing addresses with at least one directly mote-addressed content index." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 39. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 39.

28. Dependent Claim 40 - Independently Patentable

Claim 40 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 40.

Claim 21 recites:

> 21. A system comprising:
> means for determining at least one of a sensing function or a control function at a mote; and
> means for creating one or more mote-addressed content indexes in response to said determining.

Claim 40 is dependent on claim 21. Claim 40 recites:

> 40. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:
> means for associating one or more mote-appropriate routing addresses with at least one indirectly mote-addressed content index.

The Office action at page 9, paragraph 12, recites:

> 12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

Applicant respectfully traverses the rejection of claim 40.

More specifically, the Office action at page 10, paragraph 12 recites:

> As to claims 18-20 and 38-40, Mulgund shows associating one or more mote-appropriate routing addresses [note addresses (see table 20 of Fig. 3)] with at least one mote-addressed content index (Fig. 3 and Fig. 4, paragraphs [0037]-[0038]) wherein mote-addressed content index could be addressed directly or indirectly depending on the implementation (paragraph [0042]).

Mulgund at paragraphs 0037 and 0038 recites:

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a

Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

And Mulgund at paragraph 0042 recites:

[0042] In another embodiment, the database logical design 19 further comprises a Data Table List 30 that provides a mapping between individual nodes 2 and the names of the tables used to store those nodes' Sensor Data. Each of these tables is defined and created dynamically, based on the structure of the information at each node. FIG. 4 illustrates an embodiment of a network model logical design 19 for a three-node network configuration wherein each of the three nodes (A, B, C) provides a different amount of data. As such a network is traversed and the Nodes Table 20 is populated, an entry is made in the Data Table List Table 30 that identifies the name of the table associated with a given node. In the example illustrated, each node (A, B, C) has its own Node Data Table (27A-C). Each of Node Data Table is defined to accommodate the type of sensor data known to originate from that node. As discussed earlier, it is assumed that the software agent on the database server can interrogate the

node to determine what type of information it provides, and then define the table structures accordingly.

Claim 40 recites, "means for associating one or more mote-appropriate routing addresses with at least one indirectly mote-addressed content index."

In contrast to claim 40, Mulgund et al., at paragraphs 0037 and 0038, recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0038] By itself, the Nodes Table 20 is insufficient for characterizing the network's structure. Also required is a mechanism for specifying inter-node connectivity, which is provided by the Links Table 22. The primary key for the Links Table 22 is a unique Link ID number for each link 3, said number can be generated automatically by modern relational DB software. The Link Table 22 also contains Node Addresses identifying the nodes at each end of each link 3, and a Timestamp that specifies when information about a link's existence was last updated. Certain constraints exist on the Links Table 22, which are enforced externally through the use of stored procedures. Specifically, there can be only one entry in the Links Table 22 for a connection between any two nodes A and B. There cannot simultaneously be an entry {ID, A, B, Timestamp} and an entry {ID, B, A, Timestamp}. To enforce this constraint, we define a stored procedure to ensure link uniqueness when an attempt is made to enter a link definition into the Link Table 22.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al.

with the recitation of claim 40, "means for associating one or more mote-appropriate routing addresses with at least one indirectly mote-addressed content index." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "means for associating one or more mote-appropriate routing addresses with at least one indirectly mote-addressed content index." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 40. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 40.

29. Independent Claim 45

Claim 45 was rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751). Applicant respectfully traverses the rejection of claim 45.

Claim 45 recites:

45. A system comprising:
at least one mote-appropriate device; and
a mote-addressed content index having at least one of a sensing function, a control function, or routing/spatial information of said at least one mote-appropriate device.

The Office action at page 9, paragraph 12, recites:

12. Claims 1, 12, 14, 15, 18-21, 32, 34, 35, 38-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Mulgund et al. (2002/0161751).

Applicant respectfully traverses the rejection of claim 45.

More specifically, the Office action, at pages 10 and 11, paragraph 12 recites:

As to claim 45, Mulgund shows
at least one mote-appropriate device comprising a sensing node (Fig. 2 and paragraph [0026]); and
a mote-addressed content index having at least a sensing function of said at least one mote-appropriate device (Fig. 3 paragraph [0037]).

Mulgund at paragraph 0026 recites:

> [0026] FIG. 2 illustrates the nature of each of the sensing nodes 2, which comprise computational devices (possibly ranging in complexity from small embedded platforms to a fully-fledged PCs) that have one or more sensors 16 providing high-value information connected to it. The term sensor is used here in a general sense. A sensor 16 as contemplated herein could be as simple as an instrument that measures temperature, pressure, or any such other physical quantity. It could also be a device as complex as a video camera providing continuous full-motion imagery of some area of interest. In any case, the output of each of these sensors 16 is stored locally in a well-defined knowledge base 18, but the output can be accessed from outside the network 4 through some software application programming interface (API) and hardware implementation. Each of the sensing nodes 2 is additionally in communication with one or more other sensing nodes through connecting links 3.

And Mulgund at paragraph 37 recites:

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Claim 45 recites, "a mote-addressed content index having at least one of a sensing function, a control function, or routing/spatial information of said at least one mote-appropriate device." In contrast to claim 45, Mulgund et al., at paragraphs 0037 recites:

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20

> contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund et al. or any other material included in Mulgund et al. with the recitation of claim 45, " a mote-addressed content index having at least one of a sensing function, a control function, or routing/spatial information of said at least one mote-appropriate device." Hence, the Office action fails to show how Mulgund et al. teaches or suggests, "a mote-addressed content index having at least one of a sensing function, a control function, or routing/spatial information of said at least one mote-appropriate device." Thus, the Office action fails to state a *prima facie* case of anticipation with respect to claim 45. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 45.

C. Technical Material Cited in Office Action Does Not Show/Suggest Recitations of Dependent Claims 2-6, 13, 16-17, 22, 23-26, 33, 36-37, and 41-44; Notice of Allowance of Same Respectfully Requested

Claim 2

Claim 2 was rejected under 35 U.S.C. 103(a) as being unpatentable over "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Chiloyan et al. (US Patent No.: 7,165,109).

Claim 1 recites:

1. A method comprising:
   determining at least one of a sensing function or a control function at a mote; and
   creating one or more mote-addressed content indexes in response to said determining.

Claim 2 is dependent on claim 1. Claim 2 recites:

2. The method of Claim 1, wherein said determining at least one of a sensing function or a control function at a mote further comprises:

accessing at least one device entity registry.

The Office action, at page 11, paragraph 14, recites:

14. Claims 2 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Chiloyan et al. (US Patent No.: 7,165,109).

More specifically, the Office action, at page 11, paragraph 14, recites:

As to claims 2 and 22, Madden shows all the elements except for accessing at least one device entity registry.

Chiloyan shows accessing at least one device entity registry comprising having an operational system accessing device registry to check if the particular peripheral device model is included in the current device registry (col. 1 lines 50-65).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Madden by accessing at least one device entity registry in order to check if the particular device model and necessary information about the device is in the registry (col. 1 lines 58-63 in Chiloyan).

Chiloyan at col. 1, lines 50-65 recites:

Specifically, the operating system checks to see if the particular peripheral device model is included in the current device registry, and if so, loads the corresponding device driver into memory. The newly connected USB peripheral device can then be used immediately.
However, when a new USB peripheral device is connected to a computer for the first time, the USB peripheral will not be listed in the device registry. For some peripheral devices, an information file (i.e., a *.INF file) and device driver are included with the operating system, which enables 60 the operating system to add necessary information about the peripheral to the device registry and to load the device driver. However, in many cases, peripheral information and a device driver are not included with the operating system.

Chiloyan at col. 1, lines 58-63 recites:

For some peripheral devices, an information file (i.e., a *.INF file) and device driver are included with the operating system, which enables 60 the operating system to add necessary information about the peripheral to the device registry and to load the device driver. However, in many cases, peripheral information and a device driver are not included with the operating system.

The Office action, at page 11, paragraph 14, recites, "As to claims 2 and 22, Madden shows all the elements except for accessing at least one device entity registry." Applicant respectfully disagrees that Madden shows all the elements of claim 2.

Claim 2 is dependent on claim 1 and therefore includes all the recitations of claim 1. Applicant refers the Examiner to the argument provided above in response to the Office action rejection of claim 1 under 35 U.S.C. § 102. Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 2. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 2.

Claim 3

Claim 3 was rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354). Applicant respectfully traverses the rejection of claim 3.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 3 is dependent on claim 1. Claim 3 recites:

3. The method of Claim 1, wherein said determining at least one of a sensing function or a control function at a mote further comprises:
communicating with at least one device-associated entity.

The Office action at page 12, paragraph 15, recites:

15. Claims 3-6, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For

Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354).

More specifically, the Office action, at page 12, paragraph 15, recites:

> As to claims 3 and 23, Madden shows communicating with at least one device comprising a sensor to collect its reading data (section 3.1 Basic Language Features) and store it in a sensors table (lines 1-20).
>
> Madden does not expressly shows that communication is established with at least one device-associated entity.
>
> Godlewski shows communicating with at least one device-associated entity comprising a sensor interface (Fig. 1 and Fig. 4) (col. 1 lines 45-55).
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Madden by communicating with at least one device-associated entity in order to receive data from a sensor in the appropriate format (col. 1 lines 45-55 in Godlewski).

Madden at section 3.1, lines 1-20 recites:

Queries in TinyDB, as in SQL, consist of a SELECT-FROM-WHERE clause supporting selection, join, projection, and aggregation. We also include explicit support for sampling, windowing, and sub-queries via materialization points. As is the case in the Cougar and TAG work [41, 34], we view sensor data as a single table with one column per sensor type. Tuples are appended to this table periodically, at well-defined sample intervals that are a parameter of the query. The period of time between each sample interval is known as an epoch. As we discuss in Section 6, epochs provide a convenient mechanism for structuring computation to minimize power consumption. Consider the query:

SELECT nodeid, light, temp FROM sensors
SAMPLE INTERVAL is FOR lOs

This query specifies that each sensor should report its own id, light, and temperature readings (contained in the virtual table sensors) once per second for 10 seconds. Results of this query stream to the root of the network in an online fashion, via the multi-hop topology, where they may be logged or output to the user. The output consists of a sequence of tuples, clustered into Is time intervals. Each tuple includes a time stamp corresponding to the time it was produced.

Godlewski at col. 1, lines 45-55 recites:

It is a further object of the present invention to provide a system and method for transmitting data from remote sensors to a central location that can be used with a variety of remote sensors capable of detecting a variety of different types of data.

SUMMARY OF INVENTION

The present invention is directed to a system and method for communicating data from a sensor located in a remote location. A processor, a sensor interface, a power module, including a power supply, and a transport interface are provided. The sensor interface receives data from a sensor in a first format. The sensor interface converts the data into a common format if the data is not already in the common format. The transport interface receives the formatted data from the sensor interface and transmits the data to a transport system.

The Office action, at page 12, paragraph 15, recites, "As to claims 3 and 23, Madden shows communicating with at least one device comprising a sensor to collect its reading data (section 3.1 Basic Language Features) and store it in a sensors table (lines 1-20)." However, claim 3 depends from claim 1 and the Office action in rejecting claim 3 fails show how Madden teaches or suggests each of the recitations of claim 1. Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 3. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 3.

Claim 4

Claim 4 was rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354). Applicant respectfully traverses the rejection of claim 4.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 3 is dependent on claim 1. Claim 3 recites:

3. The method of Claim 1, wherein said determining at least one of a sensing function or a control function at a mote further comprises:

communicating with at least one device-associated entity.

Claim 4 is dependent on claim 3. Claim 4 recites:

4. The method of Claim 3, wherein said communicating with at least one device-associated entity further comprises:

communicating with at least one of a light device entity, an electrical device entity, a pressure device entity, a temperature device entity, a volume device entity, an inertial device entity, or an antenna entity.

The Office action at page 12, paragraph 15, recites:

15. Claims 3-6, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354).

More specifically, the Office action, at page 12, paragraph 15, recites:

As to claims 4 and 24, Madden in view of Godlewski shows communicating with at least a light device entity (col. 5 lines 58-67 and col. 6 lines 1-10).

Godlewski at col. 5, lines 58-67 and col. 6, lines 1-10 recites;

The sensor may be any commercially available or custom built sensor that can send data to the communicator through any of the communicator's ports in a format that can be interpreted by the sensor interface, as discussed above. Such a sensor might be used to measure, inter alia, traffic patterns, sound, temperature, humidity, pressure, weight, force, any form of electromagnetic radiation, the usage of electricity, gas, oil, water, or telecommunications resources, geographic location, speed, current, or the purity or composition of substances such as water. Sensors capable of measuring many of such types of data are commercially available. For example, as of the filing date of the present application, several such sensors were available from the Veriteq company of Richmond, British Columbia, Canada, namely a 5 temperature sensor, (the Spectrum 1000 Temperature Logger), a combination temperature, humidity, and dew-point sensor (the Spectrum 2000 Temperature, Humidity and Dewpoint Logger), and a combination electric current and

temperature sensor (the Spectrum 3300 Electric Current and Temperature Logger).

The Office action, at page 12, paragraph 15, recites, "As to claims 4 and 24, Madden in view of Godlewski shows communicating with at least a light device entity (col. 5 lines 58-67 and col. 6 lines 1-10)." However, claim 4 depends from claim 1 and the Office action in rejecting claim 4 fails to show how Madden teaches or suggests each of the recitations of claim 1. Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 4. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 4.

Claim 5

Claim 5 was rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354). Applicant respectfully traverses the rejection of claim 5.

Claim 1 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 3 is dependent on claim 1. Claim 3 recites:

3. The method of Claim 1, wherein said determining at least one of a sensing function or a control function at a mote further comprises:
communicating with at least one device-associated entity.

Claim 5 is dependent on claim 3. Claim 5 recites:

5. The method of Claim 3, wherein said communicating with at least one device-associated entity further comprises:
accessing at least one device identifier of a mote-addressed content index.

The Office action at page 12, paragraph 15, recites:

> 15. Claims 3-6, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354).

More specifically, the Office action, at page 12, paragraph 15, recites:

> As to claims 5 and 25, Madden shows accessing at least one device identifier of a mote-addressed content index (section 3.1 Basic Language Features lines 14-16).

Madden at section 3.1, lines 14-16 recites:

> This query specifies that each sensor should report its own id, light, and temperature readings (contained in the virtual table sensors) once per second for 10 seconds.

Claim 5 recites, "accessing at least one device identifier of a mote-addressed content index." In contrast, Madden at section 3.1, lines 14-16 recites, "This query specifies that each sensor should report its own id, light, and temperature readings (contained in the virtual table sensors) once per second for 10 seconds." Based on an analysis of the Office action, the above quoted recitation from Madden et al., and claim 5, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. with the recitation of claim 5, "accessing at least one device identifier of a mote-addressed content index." Hence, the Office action fails to show how Madden et al. teaches or suggests "accessing at least one device identifier of a mote-addressed content index." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 5. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 5.

Claim 6

Claim 6 was rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354). Applicant respectfully traverses the rejection of claim 6.

Claim 1 recites:

1. A method comprising:
   determining at least one of a sensing function or a control function at a mote; and
   creating one or more mote-addressed content indexes in response to said determining.

Claim 6 is dependent on claim 1. Claim 6 recites:

6. The method of Claim 1, wherein said determining at least one of a sensing function or a control function at a mote further comprises:
   communicating with at least one device entity using a common application protocol.

The Office action at page 12, paragraph 15, recites:

15. Claims 3-6, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354).

More specifically, the Office action, at pages 12 and 13, paragraph 15, recites:

As to claims 6 and 26, Madden in view of Godlewski shows communicating with at least one device entity using a common application protocol (Fig. 6 col. 13 lines 7-42 in Godlewski).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Madden by communicating with at least one device entity using a common application protocol in order to transmit data from a sensor to the communicator using sensor interface software (col. 13 lines 35-42 in Godlewski).

Godlewski at col. 13, lines 7-42 recites:

> Referring to FIG. 6, the data formats used in the preferred embodiment of the present invention are summarized. For purposes of simplicity, the possibility that data may be encrypted at certain stages is ignored. Data transmitted from a sensor to a connected communicator is transmitted in one of several sensor formats 600. In a first preferred embodiment, the sensor format used will ordinarily be one of digital 602, analog 604, or RS-232 606. Digital format 602 would typically be implemented with a zero to five volt direct current circuit and would provide two logic levels, on and off (or alternately open and closed or full and empty). Analog format 604 would typically be implemented with a zero to twelve volt direct current circuit and would provide a series of 256, 512, 1024, or another convenient number of steps of value. Thus, analog input would be discrete rather than continuous in nature. The use of 256 steps is particularly convenient because that is the number of states that can be represented by one byte of memory. RS-232 format 606 is a commonly accepted serial port communications format. Either binary data or ASCII formatted data can be conveniently accepted using the RS-232 protocol. ASCII format is particularly convenient in that dissemination system 240 can prepare human readable reports from ASCII formatted data without the need to know what such data represents (provided that the data itself contains all necessary labels and other elements). Binary data has the advantage of allowing more data to be packed into the same amount of message space, thereby permitting reduced usage of communications resources.
>
> Whichever sensor format is used, the data transmitted by the sensor to the communicator is reformatted by sensor interface software 126 into communicator data format 610. In a first preferred embodiment, communicator data format contains at least five fields: a date and time stamp, a communicator identification code, the sensor data, the transmit status, and the communicator status. The date and time stamp (which may be subdivided into two fields, one for the date and one for the time) stores the time and date at which the sensor conducted the underlying measurements.

The Office action, at pages 12 and 13, paragraph 15, recites, "As to claims 6 and 26, Madden in view of Godlewski shows communicating with at least one device entity using a common application protocol (Fig. 6 col. 13 lines 7-42 in Godlewski)." However, the Office action in rejecting claim 6 makes no statement as to whether Madden teaches or suggests the recitations of claim 1 from which claim 6 depends. Thus, the Office action fails to state a *prima facie* case of obviousness with respect to

claim 6. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 6.

Claim 13

Claim 13 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 13.

Claim 13 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 13 is dependent on claim 1. Claim 13 recites:

13. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
migrating to the mote;
installing an index creation agent at the mote; and
querying at least one device entity with the index creation agent.

The Office action at page 13, paragraph 16, recites:

16. Claims 13, 33, and 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action, at page 13, paragraph 16, recites:

As to claims 13 and 33, Mulgund shows
migrating to the mote comprising visiting a first sensor node (paragraph [0007] lines 18-19); and

querying at least one device entity with the index creation agent comprising interrogating a node with a network modeling agent (paragraph [0044]).

Mulgund shows that each node contains some local memory or other knowledge base for recording sensor output data, which can be retrieved by interrogating the node (paragraph [0030]), which suggests that there exists some management module that collects data from sensors and stores it in the knowledge base, however, the management module per se is not explicitly shown.

Madden shows installing an index creation agent at the mote comprising a TinyDB, which is a distributed query processor that runs on each of the nodes in a sensor network (section 1 Introduction, paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by installing an index creation agent at the mote in order to select, join, project, and aggregate data from the sensors (section 1 Introduction, paragraph 4 in Madden).

Mulgund at paragraph 0007, lines 18-19 recites:

A method according to the present invention comprises the steps of discovering and maintaining the distributed sensor network topology by applying at every access point a uqasi-recursive algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and push it onto the stack.

Mulgund at paragraph 0044 recites:

[0044] To build the database representation of the sensor network 4 described above, the NMA 14 employs a means to traverse the network in order to interrogate each node. The NMA 14 employs a quasi-recursive algorithm that is run on the database server 10 to build and maintain the database network model. The NMA 14 is a software agent resident on the database server 10 and written in any compatible computer language, whose responsibility is to build and update this model. As discussed earlier, it is assumed that there exists some software API that allows the

NMA 14 to access each node on the network, which is reached via one or more access points 6 that can be reached via Internet protocols from the database server 10.

Mulgund at paragraph 0030 recites:

[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;

Madden at section 1 Introductión, paragraph 4 recites:

We have designed and implemented an ACQP engine, called TinyDB (for more information on TinyDB, see [35]), which is a distributed query processor that runs on each of the nodes in a sensor network. TinyDB runs on the Berkeley Mica mote platform, on top of the TinyOS [23] operating system. We chose this platform because the hardware is readily available from commercial sources [13] and the operating system is relatively mature. TinyDB has many of the features of a traditional query processor (e.g. the ability to select, join, project, and aggregate data), but, as we will discuss in this paper, also incorporates a number of other features designed to minimize power consumption via acquisitional techniques. These techniques, taken in aggregate, can lead to orders of magnitude improvement in power consumption and increased accuracy of query results over non-acquisitional systems that do not actively control when and where data is collected.

Claim 13 recites, " installing an index creation agent at the mote." In contrast, Madden at section 1 Introduction, paragraph 4 recites:

We have designed and implemented an ACQP engine, called TinyDB (for more information on TinyDB, see [35]), which is a distributed query processor that runs on each of the nodes in a sensor network. TinyDB runs on the Berkeley Mica mote platform, on top of the TinyOS [23] operating system. We chose this platform because the hardware is readily available from commercial sources [13] and the operating system is relatively mature. TinyDB has many of the features of a traditional query processor (e.g. the ability to select, join, project, and aggregate data), but, as we will discuss in this paper, also incorporates a number of other features designed to minimize power consumption via acquisitional techniques. These techniques, taken in aggregate, can lead to orders of magnitude improvement in power consumption and increased accuracy of query results over non-acquisitional systems that do not actively control when and where data is collected.

Based on an analysis of the Office action, the above quoted recitation from Madden et al., and claim 13, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. with the recitation of claim 13, "installing an index creation agent at the mote." Hence, the Office action fails to show how Madden et al. teaches or suggests "installing an index creation agent at the mote." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 13. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 13.

Claim 16

Claims 16 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (2002/0161751) in view of Kung et al. (2005/0021724). Applicant respectfully traverses the rejection of claim 16.

Claim 13 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 16 is dependent on claim 1. Claim 16 recites:

16. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
determining a mote-network address of the mote;
determining one or more types of spatial information related to devices of or proximate to the mote; and
associating the one or more types of spatial information related to devices of or proximate to the mote with the mote-network address of the mote.

The Office action at page 15, paragraph 17, recites:

17. Claims 16, 17, 36, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (2002/0161751) in view of Kung et al. (2005/0021724).

More specifically, the Office action, at page 15, paragraph 17, recites:

> As to claims 16 and 36, Mulgund shows
>
> determining a mote-network address of the mote (paragraphs [0021] and [0028] [0031]); and
>
> associating the one or more types of information related to devices of or proximate to the mote with the mote-network address of the mote (Fig. 3 and paragraph [0037]).
>
> Mulgund does not show determining one or more types of spatial information related to devices of or proximate to the mote.
>
> Kung shows determining one or more types of spatial information related to devices of or proximate to the mote (paragraph [0036]).
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by determining one or more types of spatial information related to devices of or proximate to the mote in order to determine a global position of a mote that would identify a location of the mote in space (paragraph [0010] in Kung).

Mulgund at paragraphs 0021, 0028, 0031, 0037, and 0036 recites:

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

[0028] each node is addressable from the outside world or from other nodes;

[0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive

values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0036] Note that a skilled artisan will recognize that any practical implementation of the logical design 19 would have many more problem-specific elements. FIG. 3 is not intended to be limiting in any manner, but merely illustrative of the minimum requirements of a relational database logical design 19 in accordance with the present invention, specifically an embodiment in which each sensing node is collecting numeric data from n sensors.

Kung at paragraph 0010 recites:

[0010] Since sensor data is associated with the physical location of the sensor, determining the spatial coordinates of a sensor is important. Indeed, many efforts to date have focused on perfecting localization techniques. Constraints on cost, size, or power as well as the line-of-sight constraint may preclude the use of global positioning techniques, such as GPS. In this case, self-configuring sensor networks would require to use other localization methods, which could, for example, involve the use of sensors in the network itself.

Claim 16 recites, "determining one or more types of spatial information related to devices of or proximate to the mote." In contrast, Mulguand, at paragraph 0037, recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Based on an analysis of the Office action, the above quoted recitation from Mulgund, and claim 16, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund with the recitation of claim 16, "determining one or more types of spatial information related to devices of or proximate to the mote." Hence, the Office action fails to show how Madden et al. teaches or suggests "determining one or more types of spatial information related to devices of or proximate to the mote." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 16. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 16.

Claim 17

Claims 17 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (2002/0161751) in view of Kung et al. (2005/0021724). Applicant respectfully traverses the rejection of claim 17.

Claim 13 recites:

1. A method comprising:
determining at least one of a sensing function or a control function at a mote; and
creating one or more mote-addressed content indexes in response to said determining.

Claim 17 is dependent on claim 1. Claim 17 recites:

17. The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
determining a mote-network address of the mote;
determining one or more types of absolute or relative spatial information of other motes proximate to the mote; and
associating the one or more types of absolute or relative spatial information of other motes proximate to the mote with the mote-network address of the mote.

The Office action at page 15, paragraph 17, recites:

17. Claims 16, 17, 36, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (2002/0161751) in view of Kung et al. (2005/0021724).

More specifically, the Office action, at pages 16 and 17, paragraph 17, recites:

As to claims 17 and 37, Mulgund shows

determining a mote-network address of the mote (paragraphs [0021] and [0028] – [0031]); and

associating the one or more types of information of other motes proximate to the mote with the mote-network address of the mote (Fig. 3 and paragraph [0037]).

Mulgund does not show determining one or more types of absolute spatial information of other motes proximate to the mote.

Kung shows determining one or more types of absolute spatial information of other motes proximate to the mote (paragraph [0036]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by determining one or more types of absolute spatial information of other motes proximate to the mote in order to determine

a global position of a mote that would identify a location of the mote in space (paragraph , [0010] in Kung).

As to claims 17 and 37, Mulgund shows

determining a mote-network address of the mote (paragraphs [0021] and [0028] – [0031]); and

associating the one or more types of information of other motes proximate to the mote with the mote-network address of the mote (Fig. 3 and paragraph [0037]).

Mulgund does not show determining one or more types of absolute spatial information of other motes proximate to the mote.

Kung shows determining one or more types of absolute spatial information of other motes proximate to the mote (paragraph [0036]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by determining one or more types of absolute spatial information of other motes proximate to the mote in order to determine

a global position of a mote that would identify a location of the mote in space (paragraph , [0010] in Kung).

Mulgund at paragraph 21 recites:

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

Mulgund at paragraphs 0028-0031 recites:

[0028] each node is addressable from the outside world or from other nodes;
[0029] the structure and nature of the sensor(s) output data is known a priori or it can be retrieved by interrogating the node with which the sensor(s) are associated;
[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;
[0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and

Mulgund at paragraph 0037 recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Kung at paragraph 0036 recites:

[0036] The Internet and most data networks use network addresses, such as IP Address 208.154.23.54. These addresses, however, have no correlation to the node's spatial address, that is, the latitude, longitude, altitude or x,y,z coordinates. For certain embodiments, one may not need to know the spatial address of the responding node. However, if spatial information is needed, the spatial address of any node may be determined by any one of a number of known methods. For example, in some

embodiments, one or more of the nodes may have a means for determining the node's spatial address, such as, for example, a Global Positioning System (GPS) device. If any particular node does not have a GPS device, it may be able to determine its own position by communicating with other nodes that do.

And Kung at paragraph 0010 recites:

[0010] Since sensor data is associated with the physical location of the sensor, determining the spatial coordinates of a sensor is important. Indeed, many efforts to date have focused on perfecting localization techniques. Constraints on cost, size, or power as well as the line-of-sight constraint may preclude the use of global positioning techniques, such as GPS. In this case, self-configuring sensor networks would require to use other localization methods, which could, for example, involve the use of sensors in the network itself.

Claim 17 recites, "associating the one or more types of absolute or relative spatial information of other motes proximate to the mote with the mote-network address of the mote." The Office action cites to paragraph 0037 of Mulgund in support of the rejection of claim 17.

In contrast, Mulguand, at paragraph 0037, recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Based on an analysis of the Office action, the above quoted recitation from Mulgund, and claim 17, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund with the recitation of claim 17, "associating the one or

more types of absolute or relative spatial information of other motes proximate to the mote with the mote-network address of the mote." Hence, the Office action fails to show how Madden et al. teaches or suggests "associating the one or more types of absolute or relative spatial information of other motes proximate to the mote with the mote-network address of the mote." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 17. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 17.

Claim 22

Claim 22 was rejected under 35 U.S.C. 103(a) as being unpatentable over "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Chiloyan et al. (US Patent No.: 7,165,109).

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 22 is dependent on claim 21. Claim 22 recites:

22. The system of Claim 21, wherein said means for determining at least one of a sensing function or a control function at a mote further comprises:
accessing at least one device entity registry.

The Office action at page 11, paragraph 14, recites:

14. Claims 2 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Chiloyan et al. (US Patent No.: 7,165,109).

More specifically, the Office action, at page 11, paragraph 14, recites:

As to claims 2 and 22, Madden shows all the elements except for accessing at least one device entity registry.

Chiloyan shows accessing at least one device entity registry comprising having an operational system accessing device registry to check if the particular peripheral device model is included in the current device registry (col. 1 lines 50-65).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Madden by accessing at least one device entity registry in order to check if the particular device model and necessary information about the device is in the registry (col. 1 lines 58-63 in Chiloyan).

Chiloyan at col. 1, lines 50-65 recites:

Specifically, the operating system checks to see if the particular peripheral device model is included in the current device registry, and if so, loads the corresponding device driver into memory. The newly connected USB peripheral device can then be used immediately.
However, when a new USB peripheral device is connected to a computer for the first time, the USB peripheral will not be listed in the device registry. For some peripheral devices, an information file (i.e., a *.INF file) and device driver are included with the operating system, which enables 60 the operating system to add necessary information about the peripheral to the device registry and to load the device driver. However, in many cases, peripheral information and a device driver are not included with the operating system.

Chiloyan at col. 1, lines 58-63 recites:

For some peripheral devices, an information file (i.e., a *.INF file) and device driver are included with the operating system, which enables 60 the operating system to add necessary information about the peripheral to the device registry and to load the device driver. However, in many cases, peripheral information and a device driver are not included with the operating system.

The Office action, at page 11, paragraph 14, recites, "As to claims 2 and 22, Madden shows all the elements except for accessing at least one device entity registry." Applicant respectfully disagrees that Madden shows all the elements of claim 2.

Claim 22 is dependent on claim 21 and therefore includes all the recitations of claim 21. Applicant refers the Examiner to the argument provided above in response to the Office action rejection of claim 21 under 35 U.S.C. § 102. Thus, the Office action

fails to state a *prima facie* case of obviousness with respect to claim 22. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 22.

Claim 23

Claim 23 was rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354). Applicant respectfully traverses the rejection of claim 22.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 23 is dependent on claim 11. Claim 23 recites:

23. The system of Claim 21, wherein said means for determining at least one of a sensing function or a control function at a mote further comprises:
means for communicating with at least one device-associated entity.

The Office action, at page 12, paragraph 15, recites:

15. Claims 3-6, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354).

More specifically, the Office action, at page 12, paragraph 15, recites:

As to claims 3 and 23, Madden shows communicating with at least one device comprising a sensor to collect its reading data (section 3.1 Basic Language Features) and store it in a sensors table (lines 1-20).

Madden does not expressly shows that communication is established with at least one device-associated entity.

Godlewski shows communicating with at least one device-associated entity comprising a sensor interface (Fig. 1 and Fig. 4) (col. 1 lines 45-55).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Madden by communicating with at least one device-associated entity in order to receive data from a sensor in the appropriate format (col. 1 lines 45-55 in Godlewski).

Madden at section 3.1, lines 1-20 recites:

Queries in TinyDB, as in SQL, consist of a SELECT-FROM-WHERE clause supporting selection, join, projection, and aggregation. We also include explicit support for sampling, windowing, and sub-queries via materialization points. As is the case in the Cougar and TAG work [41, 34], we view sensor data as a single table with one column per sensor type. Tuples are appended to this table periodically, at well-defined sample intervals that are a parameter of the query. The period of time between each sample interval is known as an epoch. As we discuss in Section 6, epochs provide a convenient mechanism for structuring computation to minimize power consumption. Consider the query:

SELECT nodeid, light, temp FROM sensors
SAMPLE INTERVAL is FOR lOs

This query specifies that each sensor should report its own id, light, and temperature readings (contained in the virtual table sensors) once per second for 10 seconds. Results of this query stream to the root of the network in an online fashion, via the multi-hop topology, where they may be logged or output to the user. The output consists of a sequence of tuples, clustered into Is time intervals. Each tuple includes a time stamp corresponding to the time it was produced.

Godlewski at col. 1, lines 45-55 recites:

It is a further object of the present invention to provide a system and method for transmitting data from remote sensors to a central location that can be used with a variety of remote sensors capable of detecting a variety of different types of data.

SUMMARY OF INVENTION

The present invention is directed to a system and method for communicating data from a sensor located in a remote location. A

> processor, a sensor interface, a power module, including a power supply, and a transport interface are provided. The sensor interface receives data from a sensor in a first format. The sensor interface converts the data into a common format if the data is not already in the common format. The transport interface receives the formatted data from the sensor interface and transmits the data to a transport system.

The Office action, at page 12, paragraph 15, recites, "As to claims 3 and 23, Madden shows communicating with at least one device comprising a sensor to collect its reading data (section 3.1 Basic Language Features) and store it in a sensors table (lines 1-20)." However, claim 23 depends from claim 21 and the Office action in rejecting claim 23 fails show how Madden teaches or suggests each of the recitations of claim 21. Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 23. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 23.

Claim 24

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 23 is dependent on claim 21. Claim 23 recites:

23. The system of Claim 21, wherein said means for determining at least one of a sensing function or a control function at a mote further comprises:
means for communicating with at least one device-associated entity.

Claim 24 is dependent on claim 23. Claim 24 recites:

24. The system of Claim 23, wherein said means for communicating with at least one device-associated entity further comprises:
means for communicating with at least one of a light device entity, an electrical device entity, a pressure device entity, a temperature device entity, a volume device entity, an inertial device entity, or an antenna entity.

The Office action at page 12, paragraph 15, recites:

> 15. Claims 3-6, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354).

More specifically, the Office action, at page 12, paragraph 15, recites:

> As to claims 4 and 24, Madden in view of Godlewski shows communicating with at least a light device entity (col. 5 lines 58-67 and col. 6 lines 1-10).

Godlewski at col. 5, lines 58-67 and col. 6, lines 1-10 recites;

> The sensor may be any commercially available or custom built sensor that can send data to the communicator through any of the communicator's ports in a format that can be interpreted by the sensor interface, as discussed above. Such a sensor might be used to measure, inter alia, traffic patterns, sound, temperature, humidity, pressure, weight, force, any form of electromagnetic radiation, the usage of electricity, gas, oil, water, or telecommunications resources, geographic location, speed, current, or the purity or composition of substances such as water. Sensors capable of measuring many of such types of data are commercially available. For example, as of the filing date of the present application, several such sensors were available from the Veriteq company of Richmond, British Columbia, Canada, namely a 5 temperature sensor, (the Spectrum 1000 Temperature Logger), a combination temperature, humidity, and dew-point sensor (the Spectrum 2000 Temperature, Humidity and Dewpoint Logger), and a combination electric current and temperature sensor (the Spectrum 3300 Electric Current and Temperature Logger).

The Office action, at page 12, paragraph 15, recites, "As to claims 4 and 24, Madden in view of Godlewski shows communicating with at least a light device entity (col. 5 lines 58-67 and col. 6 lines 1-10)." However, claim 24 depends from claim 21 and the Office action in rejecting claim 24 fails to show how Madden teaches or suggests each of the recitations of claim 21. Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 24. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 24.

Claim 25

Claim 25 was rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354). Applicant respectfully traverses the rejection of claim 25.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 23 is dependent on claim 21. Claim 23 recites:

23. The system of Claim 21, wherein said means for determining at least one of a sensing function or a control function at a mote further comprises:
means for communicating with at least one device-associated entity.

Claim 25 is dependent on claim 23. Claim 25 recites:

25. The system of Claim 23, wherein said means for communicating with at least one device-associated entity further comprises:
means for accessing at least one device identifier of a mote-addressed content index.

The Office action, at page 12 paragraph 15, recites:

15. Claims 3-6, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354).

More specifically, the Office action at page 12, paragraph 15, recites:

As to claims 5 and 25, Madden shows accessing at least one device identifier of a mote-addressed content index (section 3.1 Basic Language Features lines 14-16).

Madden at section 3.1, lines 14-16 recites:

> This query specifies that each sensor should report its own id, light, and temperature readings (contained in the virtual table sensors) once per second for 10 seconds.

Claim 25 recites, "means for accessing at least one device identifier of a mote-addressed content index." In contrast, Madden at section 3.1, lines 14-16 recites, "This query specifies that each sensor should report its own id, light, and temperature readings (contained in the virtual table sensors) once per second for 10 seconds." Based on an analysis of the Office action, the above quoted recitation from Madden et al., and claim 25, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. with the recitation of claim 25, "means for accessing at least one device identifier of a mote-addressed content index." Hence, the Office action fails to show how Madden et al. teaches or suggests " means for accessing at least one device identifier of a mote-addressed content index." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 25. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 25.

Claim 26

Claim 26 was rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354). Applicant respectfully traverses the rejection of claim 26.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

Claim 26 is dependent on claim 21. Claim 26 recites:

26. The system of Claim 21, wherein said means for determining at least one of a sensing function or a control function at a mote further comprises:
means for communicating with at least one device entity using a common application protocol.

The Office action, at page 12 paragraph 15, recites:

15. Claims 3-6, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. in view of Godlewski (US Patent No.: 6,421,354).

More specifically, the Office action at pages 12 and 13, paragraph 15, recites:

As to claims 6 and 26, Madden in view of Godlewski shows communicating with at least one device entity using a common application protocol (Fig. 6 col. 13 lines 7-42 in Godlewski).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Madden by communicating with at least one device entity using a common application protocol in order to transmit data from a sensor to the communicator using sensor interface software (col. 13 lines 35-42 in Godlewski).

Godlewski at col. 13, lines 7-42 recites:

Referring to FIG. 6, the data formats used in the preferred embodiment of the present invention are summarized. For purposes of simplicity, the possibility that data may be encrypted at certain stages is ignored. Data transmitted from a sensor to a connected communicator is transmitted in one of several sensor formats 600. In a first preferred embodiment, the sensor format used will ordinarily be one of digital 602, analog 604, or RS-232 606. Digital format 602 would typically be implemented with a zero to five volt direct current circuit and would provide two logic levels, on and off (or alternately open and closed or full and empty). Analog format 604 would typically be implemented with a zero to twelve volt direct current circuit and would provide a series of 256, 512, 1024, or another convenient number of steps of value. Thus, analog input would be discrete rather than continuous in nature. The use of 256 steps is particularly convenient because that is the number of states that can be represented by one byte of memory. RS-232 format 606 is a commonly accepted serial port communications format. Either binary data

> or ASCII formatted data can be conveniently accepted using the RS-232 protocol. ASCII format is particularly convenient in that dissemination system 240 can prepare human readable reports from ASCII formatted data without the need to know what such data represents (provided that the data itself contains all necessary labels and other elements). Binary data has the advantage of allowing more data to be packed into the same amount of message space, thereby permitting reduced usage of communications resources.
>
> Whichever sensor format is used, the data transmitted by the sensor to the communicator is reformatted by sensor interface software 126 into communicator data format 610. In a first preferred embodiment, communicator data format contains at least five fields: a date and time stamp, a communicator identification code, the sensor data, the transmit status, and the communicator status. The date and time stamp (which may be subdivided into two fields, one for the date and one for the time) stores the time and date at which the sensor conducted the underlying measurements.

The Office action, at pages 12 and 13, paragraph 15, recites, "As to claims 6 and 26, Madden in view of Godlewski shows communicating with at least one device entity using a common application protocol (Fig. 6 col. 13 lines 7-42 in Godlewski)." However, the Office action in rejecting claim 26 makes no statement as to whether Madden teaches or suggests the recitations of claim 21 from which claim 26 depends. Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 26. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 26.

Claim 33

Claim 23 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 23.

Claim 21 recites:

21. A system comprising:

means for determining at least one of a sensing function or a control function at a mote; and

means for creating one or more mote-addressed content indexes in response to said determining.

Claim 33 is dependent on claim 21.

33. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:

means for migrating to the mote;

means for installing an index creation agent at the mote; and

means for querying at least one device entity with the index creation agent.

The Office action at page 13, paragraph 16, recites:

16. Claims 13, 33, and 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action at page 13, paragraph 16 recites:

As to claims 13 and 33, Mulgund shows migrating to the mote comprising visiting a first sensor node (paragraph [00071 lines 18-19); and

querying at least one device entity with the index creation agent comprising interrogating a node with a network modeling agent (paragraph [0044]).

Mulgund shows that each node contains some local memory or other knowledge base for recording sensor output data, which can be retrieved by interrogating the node (paragraph [0030]), which suggests that there exists some management module that collects data from sensors and stores it in the knowledge base, however, the management module per se is not explicitly shown.

Madden shows installing an index creation agent at the mote comprising a TinyDB, which is a distributed query processor that runs on each of the nodes in a sensor network (section 1 Introduction, paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by installing an index creation agent at the mote in order to select, join, project, and

aggregate data from the sensors (section 1 Introduction, paragraph .4 in Madden).

More specifically, the Office action, at page 13, paragraph 16, recites:

As to claims 13 and 33, Mulgund shows

migrating to the mote comprising visiting a first sensor node (paragraph [0007] lines 18-19); and

querying at least one device entity with the index creation agent comprising interrogating a node with a network modeling agent (paragraph [0044]).

Mulgund shows that each node contains some local memory or other knowledge base for recording sensor output data, which can be retrieved by interrogating the node (paragraph [0030]), which suggests that there exists some management module that collects data from sensors and stores it in the knowledge base, however, the management module per se is not explicitly shown.

Madden shows installing an index creation agent at the mote comprising a TinyDB, which is a distributed query processor that runs on each of the nodes in a sensor network (section 1 Introduction, paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by installing an index creation agent at the mote in order to select, join, project, and aggregate data from the sensors (section 1 Introduction, paragraph 4 in Madden).

Mulgund at paragraph 0007, lines 18-19 recites:

A method according to the present invention comprises the steps of discovering and maintaining the distributed sensor network topology by applying at every access point a uqasi-recursive algorithm, which causes the network modeling agent to visit a first sensor node and mark the first node visited, push the marked first node onto a stack, and while the stack is non-empty, query the node at the top of the stack for a list of current links to the node at the top, compare the list of current links to a list of historical links to the node at the top of the stack and update the historical link and historical node information, and if there are no unmarked nodes reachable from a current link then pop the stack, otherwise visit the next reachable unmarked node, mark the next node and push it onto the stack.

Mulgund at paragraph 0044 recites:

[0044] To build the database representation of the sensor network 4 described above, the NMA 14 employs a means to traverse the network in order to interrogate each node. The NMA 14 employs a quasi-recursive algorithm that is run on the database server 10 to build and maintain the database network model. The NMA 14 is a software agent resident on the database server 10 and written in any compatible computer language, whose responsibility is to build and update this model. As discussed earlier, it is assumed that there exists some software API that allows the NMA 14 to access each node on the network, which is reached via one or more access points 6 that can be reached via Internet protocols from the database server 10.

Mulgund at paragraph 0030 recites:

[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;

Madden at section 1 Introduction, paragraph 4 recites:

We have designed and implemented an ACQP engine, called TinyDB (for more information on TinyDB, see [35]), which is a distributed query processor that runs on each of the nodes in a sensor network. TinyDB runs on the Berkeley Mica mote platform, on top of the TinyOS [23] operating system. We chose this platform because the hardware is readily available from commercial sources [13] and the operating system is relatively mature. TinyDB has many of the features of a traditional query processor (e.g. the ability to select, join, project, and aggregate data), but, as we will discuss in this paper, also incorporates a number of other features designed to minimize power consumption via acquisitional techniques. These techniques, taken in aggregate, can lead to orders of magnitude improvement in power consumption and increased accuracy of query results over non-acquisitional systems that do not actively control when and where data is collected.

Claim 33 recites, "means for installing an index creation agent at the mote." In contrast, Madden at section 1 Introduction, paragraph 4 recites:

We have designed and implemented an ACQP engine, called TinyDB (for more information on TinyDB, see [35]), which is a distributed query processor that runs on each of the nodes in a sensor network. TinyDB runs on the Berkeley Mica mote platform, on top of the TinyOS [23] operating system. We chose this platform because the hardware is readily available

> from commercial sources [13] and the operating system is relatively mature. TinyDB has many of the features of a traditional query processor (e.g. the ability to select, join, project, and aggregate data), but, as we will discuss in this paper, also incorporates a number of other features designed to minimize power consumption via acquisitional techniques. These techniques, taken in aggregate, can lead to orders of magnitude improvement in power consumption and increased accuracy of query results over non-acquisitional systems that do not actively control when and where data is collected.

Based on an analysis of the Office action, the above quoted recitation from Madden et al., and claim 33, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Madden et al. with the recitation of claim 33, "means for installing an index creation agent at the mote." Hence, the Office action fails to show how Madden et al. teaches or suggests "means for installing an index creation agent at the mote." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 33. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 33.

Claim 36

Claims 36 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (2002/0161751) in view of Kung et al. (2005/0021724). Applicant respectfully traverses the rejection of claim 36.

Claim 21 recites:

> 21. A system comprising:
> means for determining at least one of a sensing function or a control function at a mote; and
> means for creating one or more mote-addressed content indexes in response to said determining.

Claim 36 is dependent on claim 21. Claim 36 recites:

> 36. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:
> means for determining a mote-network address of the mote;

means for determining one or more types of spatial information related to devices of or proximate to the mote; and

means for associating the one or more types of spatial information related to devices of or proximate to the mote with the mote-network address of the mote.

The Office action at page 15, paragraph 17 recites:

17. Claims 16, 17, 36, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (2002/0161751) in view of Kung et al. (2005/0021724).

More specifically, the Office action at pages 15 and 16, paragraph 17 recites:

As to claims 16 and 36, Mulgund shows
determining a mote-network address of the mote (paragraphs [0021] and [0028] [0031]); and

associating the one or more types of information related to devices of or proximate to the mote with the mote-network address of the mote (Fig. 3 and paragraph [0037]).

Mulgund does not show determining one or more types of spatial information related to devices of or proximate to the mote.
Kung shows determining one or more types of spatial information related to devices of or proximate to the mote (paragraph [0036]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by determining one or more types of spatial information related to devices of or proximate to the mote in order to determine a global position of a mote that would identify a location of the mote in space (paragraph [0010] in Kung).
Mulgund at paragraphs 0021, 0028, 0031, 0037, and 0036 recites:

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

[0028] each node is addressable from the outside world or from other nodes;

[0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is

a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0036] Note that a skilled artisan will recognize that any practical implementation of the logical design 19 would have many more problem-specific elements. FIG. 3 is not intended to be limiting in any manner, but merely illustrative of the minimum requirements of a relational database logical design 19 in accordance with the present invention, specifically an embodiment in which each sensing node is collecting numeric data from n sensors.

Kung at paragraph 0010 recites:

[0010] Since sensor data is associated with the physical location of the sensor, determining the spatial coordinates of a sensor is important. Indeed, many efforts to date have focused on perfecting localization techniques. Constraints on cost, size, or power as well as the line-of-sight constraint may preclude the use of global positioning techniques, such as GPS. In this case, self-configuring sensor networks would require to use other localization methods, which could, for example, involve the use of sensors in the network itself.

Claim 36 recites, "means for determining one or more types of spatial information related to devices of or proximate to the mote." In contrast, Mulguand, at paragraph 0037, recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an

> active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Based on an analysis of the Office action, the above quoted recitation from Mulgund, and claim 36, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund with the recitation of claim 36, "means for determining one or more types of spatial information related to devices of or proximate to the mote." Hence, the Office action fails to show how Madden et al. teaches or suggests "means for determining one or more types of spatial information related to devices of or proximate to the mote." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 36. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 36.

Claim 37

Claims 37 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (2002/0161751) in view of Kung et al. (2005/0021724). Applicant respectfully traverses the rejection of claim 37.

> Claim 21 recites:
>
> 21. A system comprising:
> means for determining at least one of a sensing function or a control function at a mote; and
> means for creating one or more mote-addressed content indexes in response to said determining.
>
> Claim 37 is dependent on claim 21. Claim 37 recites:
>
> 37. The system of Claim 21, wherein said means for creating one or more mote-addressed content indexes in response to said determining further comprises:
> means for determining a mote-network address of the mote;

means for determining one or more types of absolute or relative spatial information of other motes proximate to the mote; and

means for associating the one or more types of absolute or relative spatial information of other motes proximate to the mote with the mote-network address of the mote.

The Office action at page 15, paragraph 17 recites:

17. Claims 16, 17, 36, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (2002/0161751) in view of Kung et al. (2005/0021724).

More specifically, the Office action at pages 16 and 17, paragraph 17 recites:

As to claims 17 and 37, Mulgund shows

determining a mote-network address of the mote (paragraphs [0021] and [0028] – [0031]); and

associating the one or more types of information of other motes proximate to the mote with the mote-network address of the mote (Fig. 3 and paragraph [0037]).

Mulgund does not show determining one or more types of absolute spatial information of other motes proximate to the mote.

Kung shows determining one or more types of absolute spatial information of other motes proximate to the mote (paragraph [0036]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by determining one or more types of absolute spatial information of other motes proximate to the mote in order to determine a global position of a mote that would identify a location of the mote in space (paragraph , [0010] in Kung).

Mulgund at paragraph 21 recites:

[0021] an identity (unique identifying information such as a numeric address) of each of the sensing nodes 2 in the network 4, as well as any metadata about each node;

Mulgund at paragraphs 0028-0031 recites:

[0028] each node is addressable from the outside world or from other nodes;

[0029] the structure and nature of the sensor(s) output data is known a priori or it can be retrieved by interrogating the node with which the sensor(s) are associated;

[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;
[0031] each node uses networking protocols that allow it to communicate with its neighboring nodes in the ad hoc sensor network (again, it is of no import how the sensor network came into being, how its connectivity is specified, or how nodes find one another); and

Mulgund at paragraph 0037 recites:

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Kung at paragraph 0036 recites:

[0036] The Internet and most data networks use network addresses, such as IP Address 208.154.23.54. These addresses, however, have no correlation to the node's spatial address, that is, the latitude, longitude, altitude or x,y,z coordinates. For certain embodiments, one may not need to know the spatial address of the responding node. However, if spatial information is needed, the spatial address of any node may be determined by any one of a number of known methods. For example, in some embodiments, one or more of the nodes may have a means for determining the node's spatial address, such as, for example, a Global Positioning System (GPS) device. If any particular node does not have a GPS device, it may be able to determine its own position by communicating with other nodes that do.

And Kung at paragraph 0010 recites:

[0010] Since sensor data is associated with the physical location of the sensor, determining the spatial coordinates of a sensor is important. Indeed, many efforts to date have focused on perfecting localization techniques. Constraints on cost, size, or power as well as the line-of-sight

> constraint may preclude the use of global positioning techniques, such as GPS. In this case, self-configuring sensor networks would require to use other localization methods, which could, for example, involve the use of sensors in the network itself.

Claim 37 recites, "means for associating the one or more types of absolute or relative spatial information of other motes proximate to the mote with the mote-network address of the mote." The Office action cites to paragraph 0037 of Mulgund in support of the rejection of claim 37.

In contrast, Mulguand, at paragraph 0037, recites:

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Based on an analysis of the Office action, the above quoted recitation from Mulgund, and claim 37, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund with the recitation of claim 37, "means for associating the one or more types of absolute or relative spatial information of other motes proximate to the mote with the mote-network address of the mote." Hence, the Office action fails to show how Madden et al. teaches or suggests "means for associating the one or more types of absolute or relative spatial information of other motes proximate to the mote with the mote-network address of the mote." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 37. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 37.

Claim 41

Claim 41 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 41.

Claim 41 recites:

41. A system comprising:
at least one mote-appropriate device; and
at least one index creation agent resident in a mote, said at least one index creation agent configured to create at least one of a sensing index, a control index, or a routing/spatial index.

The Office action at page 15, paragraph 17 recites:

16. Claims 13, 33, and 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action at page 14, paragraph 16 recites:

As to claim 41, Mulgund shows
at least one mote-appropriate device comprising a sensing node (Fig. 2 and paragraph [0026]); and
at least one index creation agent comprising a sensor network modeling agent, said at least one index creation agent configured to create at least one of a sensing index, a control index, or a routing/spatial index (Fig. 3 and paragraph [0037]).

Mulgund also shows that each node contains some local memory or other knowledge base for recording sensor output data, which can be retrieved by interrogating the node (paragraph [0030]), which suggests that there exists some agent resident in a mote that collects data from sensors and stores it in the local knowledge base, however, the local agent per se is not explicitly shown.

Madden shows an index creation agent resident in a mote comprising a TinyDB, which is a distributed query processor that runs on each of the nodes in a sensor network (section 1 Introduction, paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by having an index creation agent resident in the mote in order to select, join, project, and aggregate data from the sensors (section 1 Introduction, paragraph 4 in Madden).

Mulgund at paragraphs 0026, 0037, and 0030 recites:

[0026] FIG. 2 illustrates the nature of each of the sensing nodes 2, which comprise computational devices (possibly ranging in complexity from small embedded platforms to a fully-fledged PCs) that have one or more sensors 16 providing high-value information connected to it. The term sensor is used here in a general sense. A sensor 16 as contemplated herein could be as simple as an instrument that measures temperature, pressure, or any such other physical quantity. It could also be a device as complex as a video camera providing continuous full-motion imagery of some area of interest. In any case, the output of each of these sensors 16 is stored locally in a well-defined knowledge base 18, but the output can be accessed from outside the network 4 through some software application programming interface (API) and hardware implementation. Each of the sensing nodes 2 is additionally in communication with one or more other sensing nodes through connecting links 3.

[0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

[0030] each node contains some local memory or other knowledge base 18 for recording sensor output data, which can be retrieved by interrogating the node;

Madden at section 1 Introduction, paragraph 4 recites:

We have designed and implemented an ACQP engine, called TinyDB (for more information on TinyDB, see [35]), which is a distributed query

> processor that runs on each of the nodes in a sensor network. TinyDB runs on the Berkeley Mica mote platform, on top of the TinyOS [23] operating system. We chose this platform because the hardware is readily available from commercial sources [13] and the operating system is relatively mature. TinyDB has many of the features of a traditional query processor (e.g. the ability to select, join, project, and aggregate data), but, as we will discuss in this paper, also incorporates a number of other features designed to minimize power consumption via acquisitional techniques. These techniques, taken in aggregate, can lead to orders of magnitude improvement in power consumption and increased accuracy of query results over non-acquisitional systems that do not actively control when and where data is collected.

Claim 41 recites, "at least one index creation agent resident in a mote, said at least one index creation agent configured to create at least one of a sensing index, a control index, or a routing/spatial index." The Office action cites to paragraph 0037 of Mulgund in support of the rejection of claim 41.

In contrast, Mulgund, at paragraph 0037, recites:

> [0037] The Nodes Table 20 maintains a list of all known sensor nodes 2 in the network 4. Each node is identified by a unique Node Address, which is a primary key for the Nodes Table 20. The Nodes Table also contains a Status field, which is used to indicate whether a node is known to be active. This field is used for marking nodes that have disappeared from the network (which could later reappear). At present, it is anticipated that this Status variable will take on one of just a small set of mutually exclusive values that indicate whether or not the associated node continues to be an active, reachable member of the network 4. Finally, the Nodes Table 20 contains a Timestamp field that indicates when the Status information was last updated. When a node disappears from the network for whatever reason, the corresponding entry in the Nodes Table 20 is not deleted; it is marked as unreachable. The reason for doing so is explained below.

Based on an analysis of the Office action, the above quoted recitation from Mulgund, and claim 41, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund with the recitation of claim 41, "at least one index creation agent resident in a mote, said at least one index creation agent configured to create at least one of a sensing index, a control index, or a routing/spatial index." Hence, the Office action fails to show how Madden et al. teaches or suggests "at least one index

creation agent resident in a mote, said at least one index creation agent configured to create at least one of a sensing index, a control index, or a routing/spatial index."
Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 41. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 41.

Claim 42

Claim 42 is dependent on claim 41. For reasons analogous to those provided above, applicant respectfully submits that the Office action fails to make a *prima facie* case of obviousness with respect to claim 42. Therefore, applicant requests withdrawal of the rejection and reconsideration and allowance of claim 42.

Claim 43

Claim 43 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 43.

Claim 41 recites:

41. A system comprising:
at least one mote-appropriate device; and
at least one index creation agent resident in a mote, said at least one index creation agent configured to create at least one of a sensing index, a control index, or a routing/spatial index.

Claim 43 is dependent on claim 41. Claim 43 recites:

43. The system of Claim 41, wherein said at least one index creation agent resident in a mote further comprises:
a processor configured to obtain at least one of a sensing function, a control function, or routing/spatial information of the mote.

The Office action at page 13, paragraph 16 recites:

16. Claims 13, 33, and 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action at page 15, paragraph 16 recites:

> As to claim 43, Mulgund in view of Madden shows a processor configured to obtain at least a sensing function of the mote (section 2.1 Properties of Sensor Devices, paragraph 2).
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus of Mulgund by having a processor in order to process sensor data that is being stored in a knowledge base (Fig. 2 in Mulgund).

Madden at section 2.1, paragraph 2 recites:

> Mica motes have a 4Mhz, 8bit Atmel microprocessor. Their RFM TRI000 radios run at 40 kbits/second over a single shared CSMA channel. Radio messages are variable size. Typically about 10 48-byte messages (the default size in TinyDB) can be delivered per second. Power consumption tends to be dominated by radio communication. When powered on, radios consume about as much power as the processor. However, because communication is so slow, every bit of data transmitted by the radio costs as much energy as executing 1000 CPU instructions. As an additional feature, motes have an external 32kHz clock that the TinyOS operating system can synchronize with neighboring motes +/- 1 ms to ensure that neighbors will be powered up and listening when they wish to send a message[15].

Claim 43 recites, "a processor configured to obtain at least one of a sensing function, a control function, or routing/spatial information of the mote." The Office action cites to section 2.1, paragraph 2, of Madden to support the rejection of claim 43.

Madden at section 2.1, paragraph 2 recites:

> Mica motes have a 4Mhz, 8bit Atmel microprocessor. Their RFM TRI000 radios run at 40 kbits/second over a single shared CSMA channel. Radio messages are variable size. Typically about 10 48-byte messages (the default size in TinyDB) can be delivered per second. Power consumption tends to be dominated by radio communication. When powered on, radios consume about as much power as the processor. However, because communication is so slow, every bit of data transmitted by the radio costs as much energy as executing 1000 CPU instructions. As an additional feature, motes have an external 32kHz clock that the TinyOS operating

system can synchronize with neighboring motes +/- 1 ms to ensure that neighbors will be powered up and listening when they wish to send a message[15].

The Office action fails to cite to specific information in Mulgund in forming the rejection. Based on an analysis of the Office action, the above quoted recitation from Madden, and claim 43, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund with the recitation of claim 43, "a processor configured to obtain at least one of a sensing function, a control function, or routing/spatial information of the mote." Hence, the Office action fails to show how Madden et al. or Madden et al. in view of Mulgund teaches or suggests "a processor configured to obtain at least one of a sensing function, a control function, or routing/spatial information of the mote." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 43. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 43.

Claim 44

Claim 44 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 44.

Claim 41 recites:

41. A system comprising:
at least one mote-appropriate device; and
at least one index creation agent resident in a mote, said at least one index creation agent configured to create at least one of a sensing index, a control index, or a routing/spatial index.

Claim 44 is dependent on claim 41. Claim 44 recites:

44. The system of Claim 41, wherein the mote comprises:
at least one of a processor, a memory, or a communications device formed from a substrate.

The Office action at page 13, paragraph 16 recites:

16. Claims 13, 33, and 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (20021016175l) in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al.

More specifically, the Office action at page 15, paragraph 16 recites:

As to claim 44, Mulgund shows at least one of a processor, a memory, or a communications devices formed from a substrate (paragraph [0026]).

Mulgund at paragraph 0026 recites:

[0026] FIG. 2 illustrates the nature of each of the sensing nodes 2, which comprise computational devices (possibly ranging in complexity from small embedded platforms to a fully-fledged PCs) that have one or more sensors 16 providing high-value information connected to it. The term sensor is used here in a general sense. A sensor 16 as contemplated herein could be as simple as an instrument that measures temperature, pressure, or any such other physical quantity. It could also be a device as complex as a video camera providing continuous full-motion imagery of some area of interest. In any case, the output of each of these sensors 16 is stored locally in a well-defined knowledge base 18, but the output can be accessed from outside the network 4 through some software application programming interface (API) and hardware implementation. Each of the sensing nodes 2 is additionally in communication with one or more other sensing nodes through connecting links 3.

Claim 44 recites, "at least one of a processor, a memory, or a communications device formed from a substrate." The Office action cites to Mulgund paragraph 0026 to support the rejection of claim 44.

Mulgund at paragraph 0026 recites:

[0026] FIG. 2 illustrates the nature of each of the sensing nodes 2, which comprise computational devices (possibly ranging in complexity from small embedded platforms to a fully-fledged PCs) that have one or more sensors 16 providing high-value information connected to it. The term sensor is used here in a general sense. A sensor 16 as contemplated herein could be as simple as an instrument that measures temperature, pressure, or any such other physical quantity. It could also be a device as complex

as a video camera providing continuous full-motion imagery of some area of interest. In any case, the output of each of these sensors 16 is stored locally in a well-defined knowledge base 18, but the output can be accessed from outside the network 4 through some software application programming interface (API) and hardware implementation. Each of the sensing nodes 2 is additionally in communication with one or more other sensing nodes through connecting links 3.

Based on an analysis of the Office action, the above quoted recitation from Madden, and claim 44, Applicant respectfully submits that the Office action has supplied no text, reference, or knowledge explaining why one skilled in the art should equate the above quoted material from Mulgund with the recitation of claim 44, "at least one of a processor, a memory, or a communications device formed from a substrate." Hence, the Office action fails to show how Madden et al. or Madden et al. in view of Mulgund teaches or suggests "at least one of a processor, a memory, or a communications device formed from a substrate." Thus, the Office action fails to state a *prima facie* case of obviousness with respect to claim 44. Therefore, Applicant requests withdrawal of the rejection and reconsideration and allowance of claim 44.

IV. ARGUMENT: THE OFFICE ACTION ERRED IN REJECTING CLAIMS 21-40 UNDER 35 U.S.C. § 101

Claims 21-40 were rejected under 35 U.S.C. 101 as non-statutory subject mater. Applicant respectfully traverses the rejection of claims 21-40.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

The Office action at page 4, paragraph 5 recites:

As to claim 21, index creation agent appears to be a computer program (for the interpretation of means plus function language please refer to

Claim Rejections - 35 USC §112 section of the Office Action). A system Comprising a computer program per se is not in one of the statutory categories.

Thus, in support of the rejection of claim 21, the Office action recites, "index creation agent appears to be a computer program." However, claim 21 does not recite "index creation agent." Thus, the grounds (i.e., "index creation agent appears to be a computer program") of the rejection set forth in the Office action" fails to support a rejection of claim 21 under 101. As the rejection includes no other grounds for the rejection, the Office action fails to establish that claim 21 is directed to non-statutory subject matter. Therefore, applicant requests withdrawal of the rejection and reconsideration and allowance of claim 21.

Claims 22-40 are dependent on claim 21. For reasons analogous to those stated above, applicant requests withdrawal of the rejections and reconsideration and allowance of claims 22-40.

V. ARGUMENT: THE OFFICE ACTION ERRED IN REJECTING CLAIMS 21-40 UNDER 35 U.S.C. § 112, FIRST PARAGRAPH

The Office action, at page 4, paragraph 7, recites, "Claims 21-40 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement." Applicant respectfully traverses the rejections of claims 13-24.

Claim 21 recites:

21. A system comprising:
means for determining at least one of a sensing function or a control function at a mote; and
means for creating one or more mote-addressed content indexes in response to said determining.

The Office action at page 5, paragraph 7, recites:

. . . claim 21 appears to be a single means claim, i.e., where a means recitation does not appear in combination with another recited element of

> means, and is, therefore subject to an undue breadth rejection under 35 U.S.C. 112, first paragraph.

Applicant respectfully disagrees with the Office action conclusion that claim 21 exemplifies a single means claim. More specifically, claim 21 includes two "means" recitations. First, claim 21 recites, "means for determining . . . ." Second claim 21 recites, "means for creating . . . ." Thus, claim 21 includes a combination and is not subject to the single means rejection.

The Office action, at page 5, recites:

> The current specification shows that determining at least one of a sensing function or a control function at a mote and creating one or more mote-addressed content indexes in response to said determining is performed by an index creation agent (202) (bottom of page 9, page 10). Therefore, means for determining are interpreted to be an index creation agent (202), and Means for creating are also interpreted to be an index creation agent (202).

However, the Office action cites no authority for the assertion that claim 21, which includes two "means" recitations is reduced to a "single means" claim by the identification of a structure in the specification capable of realizing each of the two "means" clauses. Therefore, application requests withdrawal of the rejection and reconsideration and allowance of claim 21. Applicant respectfully requests citation to authority if the Office maintains this "single means" rejection.

Claims 22-40 are dependent on claim 21. For reasons analogous to those stated above, applicant requests withdrawal of the rejections and reconsideration and allowance of claims 22-40.

Further, claim 21 was rejected as a "single means" claim. As noted above, claim 21 includes at least two "means" recitations. Hence, claim 21 does not exemplify a single means claim. Thus, claims 21-40 do not depend from a single means claim and are not subject to a single means rejection.

Assuming *arguendo* that claim 21 is a single means claims, dependent claims 22-40, which depend from claim 21, are not single-means claims. More specifically, each of the claims 22-40 adds at least one further recitation to claim 21. Hence each of the claims 22-40 include at least two elements and are therefore not subject to the single

means rejection of claim 21. Therefore, applicant requests withdrawal of the rejections and reconsideration and allowance of claims 22-40.

Claims 22-40 are dependent on claim 21. For reasons analogous to those stated above, applicant requests withdrawal of the rejections and reconsideration and allowance of claims 22-40.

VI. ARGUMENT: THE OFFICE ACTION ERRED IN REJECTING CLAIMS 25 AND 28 UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

Claims 12-13, 32-33, and 41-44 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant respectfully traverses the rejections of claims 12-13, 32-33, and 41-44.

Claim 12 recites:

> The method of Claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
> establishing an index-creating agent at the mote;
> determining a mote-network address of the mote; and
> associating at least one of a mote-addressed sensing index, a note-addressed control index, or a note-addressed routing/spatial index with the mote-network address of the mote.

Claim 13 recites:

> The method of claim 1, wherein said creating one or more mote-addressed content indexes in response to said determining further comprises:
> migrating to the mote;
> installing an index creation agent at the mote; and
> querying at least one device entity with the index creation agent.

The Office action at page 6, recites, "As to claims 12 and 13 (and corresponding claims 32 and 33), the step of establishing an index-creating agent at the mote in response to said step of determining is ambiguous because the order of steps is unclear." Applicant respectfully submits that Applicant is under no obligation to provide an order for recitations in a method claim. Therefore, applicant requests withdrawal of the rejections and reconsideration and allowance of claims 12 and 13. If the Office maintains these rejections in the next Office action, applicant respectfully requests citation to legal authority that supports the grounds of the rejection.

For reasons analogous to those provide above, Applicant requests withdrawal of the rejections and reconsideration and allowance of claims 32 and 33.

The Office action, at page 6, recites, "As to claim 41, it is ambiguous because it is unclear if at least one mote-appropriate device is a mote or the two devices claimed (mote-appropriate device and a mote) are unrelated to each other."

Claim 41 recites:

> A system comprising:
> at least one mote-appropriate device; and
> at least one index creation agent resident in a mote, said at least one index creation agent configured to create at least one of a sensing index, a control index, or a routing/spatial index.

Applicant respectfully submits that claim 41 is unambiguous. The recitations, "one mote-appropriate device" and "a mote" are unambiguous if the ordinary meaning of each is considered. A difficult issue of claim construction is an insufficient basis for rejection an claim under 35 U.S.C. 112, second paragraph. (Exxon Research & Eng'g Co. v. United States, 265 F.3d. 1371, 60 USPQ2d 1272 (Fed. Cir. 2001))

Claim 43 recites:

> The system of Claim 41, wherein said at least one index creation agent resident in a mote further comprises:
> a processor configured to obtain at least one of a sensing function, a control function, or routing/spatial information of the mote.

The Office action, at page 7, recites, "As to claim 43, it is ambiguous because it is unclear how an index creation agent, which is a software program, comprises a processor, which appears to be a hardware component." Applicant respectfully disagrees with the conclusion of the Office action that an index creation agent is limited to a software program. The recitation of an index creation agent in the claims includes no such limitation. Therefore, applicant requests withdrawal of the rejection and reconsideration and allowance of claim 43.

VII. OBJECTION TO THE ABSTRACT OF THE DISCLOSURE

The Office action, at page 3, raises an objection to the abstract of the disclosure under MPEP §608.01(b). Applicant respectfully traverses the objection to the disclosure.

Independent claims 1 and 21 recite "indexes." Further, independent claims 1 and 21 recite "a mote." Independent claim 41 recites, "control index." and "a mote." The abstract recites, " Methods and /or systems relating to mote networks having one or more indexes." Thus, the abstract includes recitations included in the independent claims. Hence, applicant respectfully submits that the abstract permits one "to determine quickly . . . the nature and gist of the technical disclosure." Therefore, applicant requests withdrawal of the objection.

VIII. OBJECTION TO THE SPECIFICATION

The Office action, at page 3, raises an objection to the specification. Applicant respectfully traverses the objection to the disclosure.

Applicant respectfully submits that at this time the proper scope of the specification cannot be determined as the prosecution of the application is not complete. If the Office maintains this objection in the next Office action, Applicant requests that the

Office action include citation to legal authority, such as citation to statutes or regulations, in support of the objection.

IX. CONCLUSION

Applicant may have herein cancelled and/or amended one or more claims. Applicant notes that any such cancellations and/or amendments will have transpired (i) prior to issuance and (ii) in the context of the rules that govern claim interpretation during prosecution before the United States Patent and Trademark Office (USPTO). Applicant notes that the rules that govern claim interpretation during prosecution form a radically different context than the rules that govern claim interpretation subsequent to a patent issuing. Accordingly, Applicant respectfully submits that any cancellations and/or amendments herein should be held to be tangential to and/or unrelated to patentability in the event that such cancellations and/or amendments are viewed in a post-issuance context under post-issuance claim interpretation rules.

Insofar as that the Applicant may have herein cancelled/amended claims sufficient to obtain a Notice of Allowability of all claims pending, Applicant may not have herein explicitly addressed all rejections and/or statements in Examiner's Office Action. The fact that rejections and/or statements may not be herein explicitly addressed should NOT be taken as an admission of any sort, and Applicant hereby reserves any and all rights to contest such rejections and/or statements at a later time. Specifically, no waiver (legal, factual, or otherwise), implicit or explicit, is hereby intended (e.g., with respect to any facts of which Examiner took Official Notice, and/or for which Examiner has supplied no objective showing, Applicant hereby contests those facts and requests express documentary proof of such facts at such time at which such facts may become relevant). For example, although not expressly set forth herein, Applicant continues to assert all points of (e.g. caused by, resulting from, responsive to, etc.) any previous Office Action, and no waiver (legal, factual, or otherwise), implicit or explicit, is hereby intended. Specifically, insofar as that Applicant does not consider the cancelled/unamended claims

to be unpatentable, Applicant hereby gives notice that it intends to file and/or has filed a continuing application in order prosecute such unamended claims.

While particular aspects of the present subject matter described herein have been shown and described, it will be apparent to those skilled in the art that, based upon the teachings herein, changes and modifications may be made without departing from the subject matter described herein and its broader aspects and, therefore, the appended claims are to encompass within their scope all such changes and modifications as are within the true spirit and scope of the subject matter described herein. Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., " a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to "at least one of A, B, or C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., " a system having at least one of A, B, or C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase "A or B" will be understood to include the possibilities of "A" or "B" or "A and B."

With respect to any cancelled claims, such cancelled claims were and continue to be a part of the original and/or present patent application(s). Applicant hereby reserves all rights to present any cancelled claim or claims for examination at a later time in this or another application. Applicant hereby gives public notice that any cancelled claims are still to be considered as present in all related patent application(s) (e.g. the original and/or present patent application) for all appropriate purposes (e.g., written description and/or

enablement). Applicant does NOT intend to dedicate the subject matter of any cancelled claims to the public.

The Examiner is encouraged to contact the undersigned by telephone at 952-876-4093 to discuss the above and any other distinctions between the claims and the applied references, if desired. Also, if the Examiner notes any informalities in the claims, he is encouraged to contact the undersigned to expediently correct such informalities.

Respectfully submitted,

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